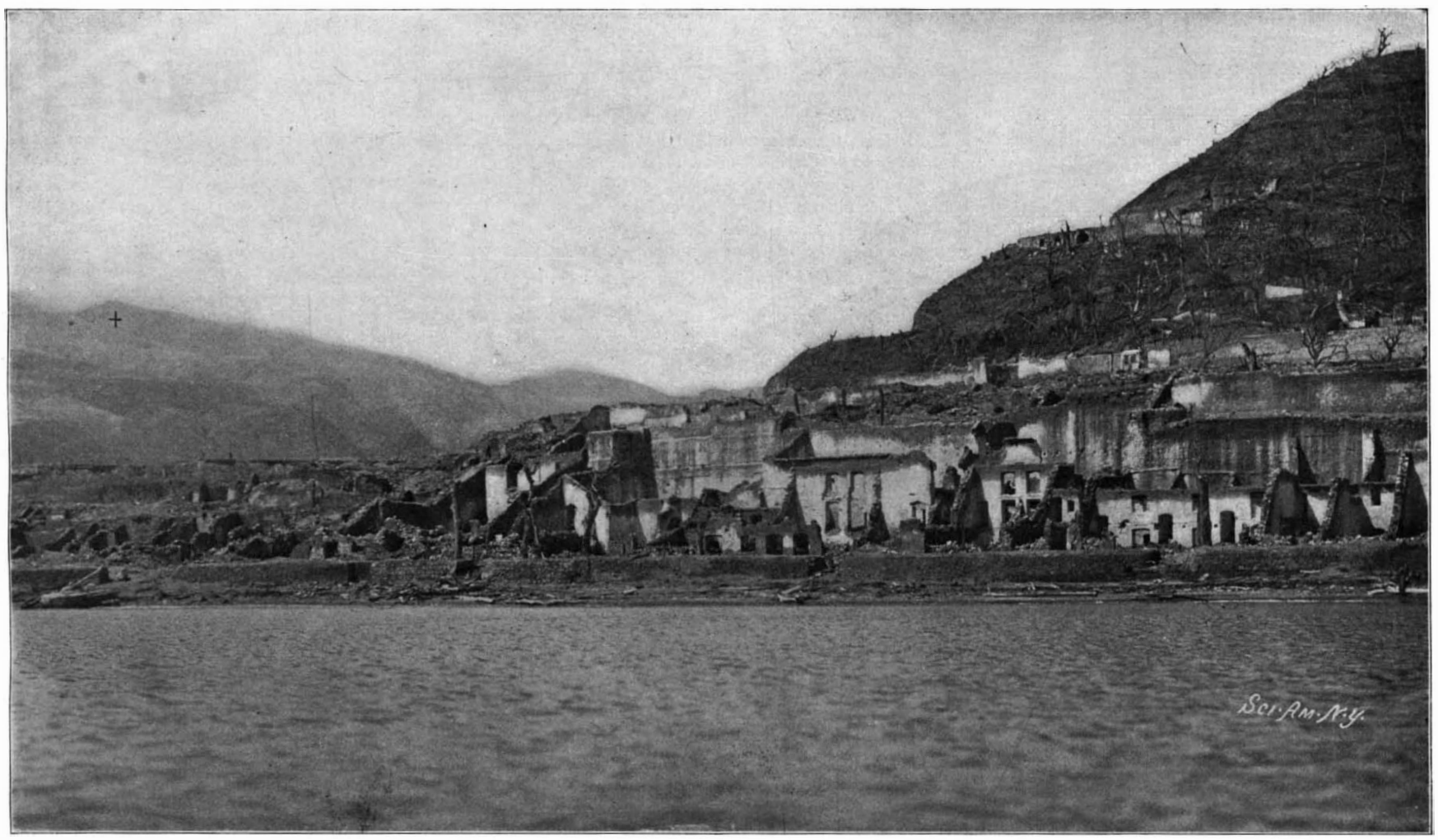
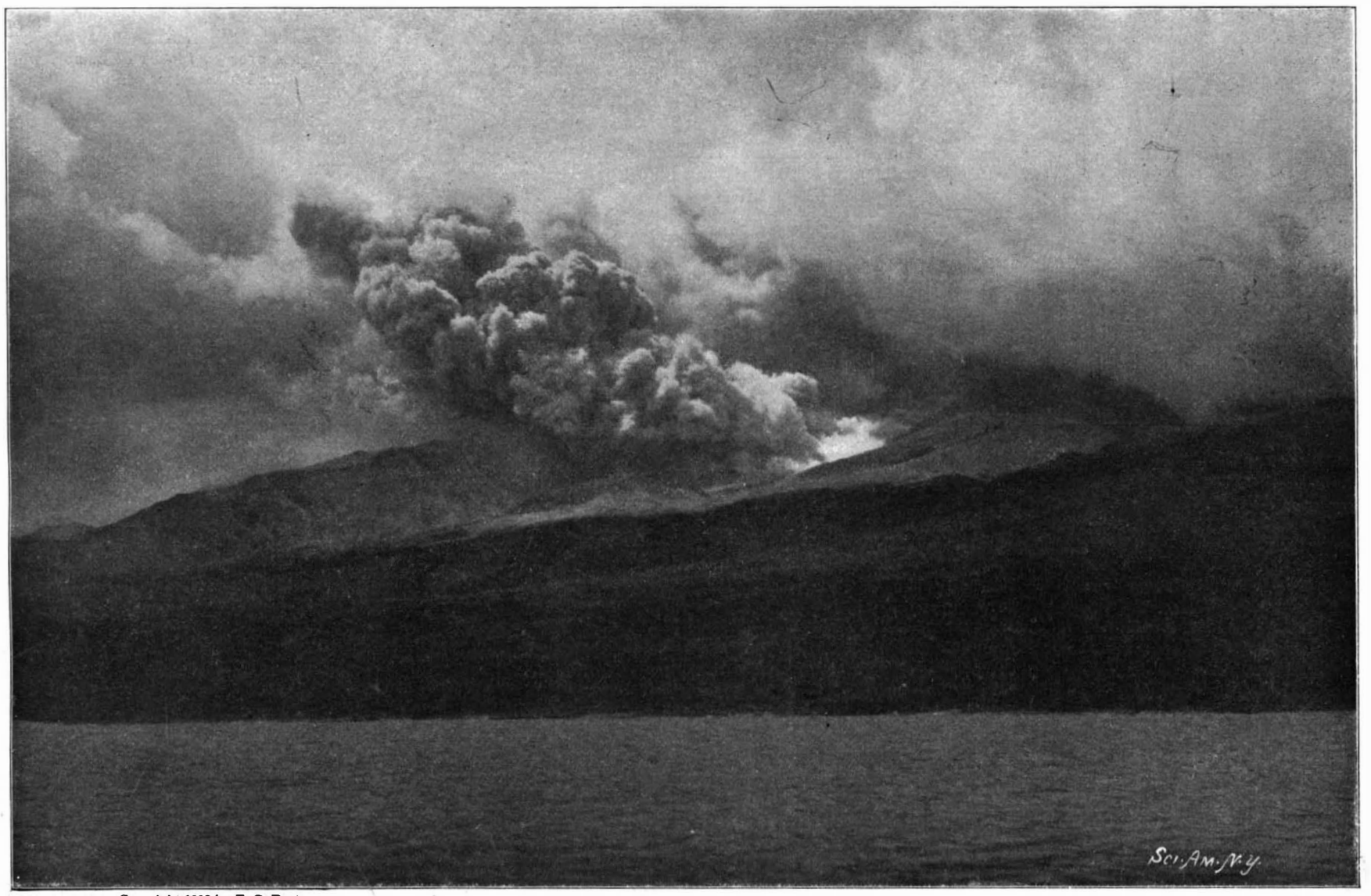
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1902, by Munn & Co.]

Vol. LXXXVII.—No. 7. ESTABLISHED 1845. NEW YORK, AUGUST 16, 1902. $3.00 A YEAR. 8 CENTS A COPY



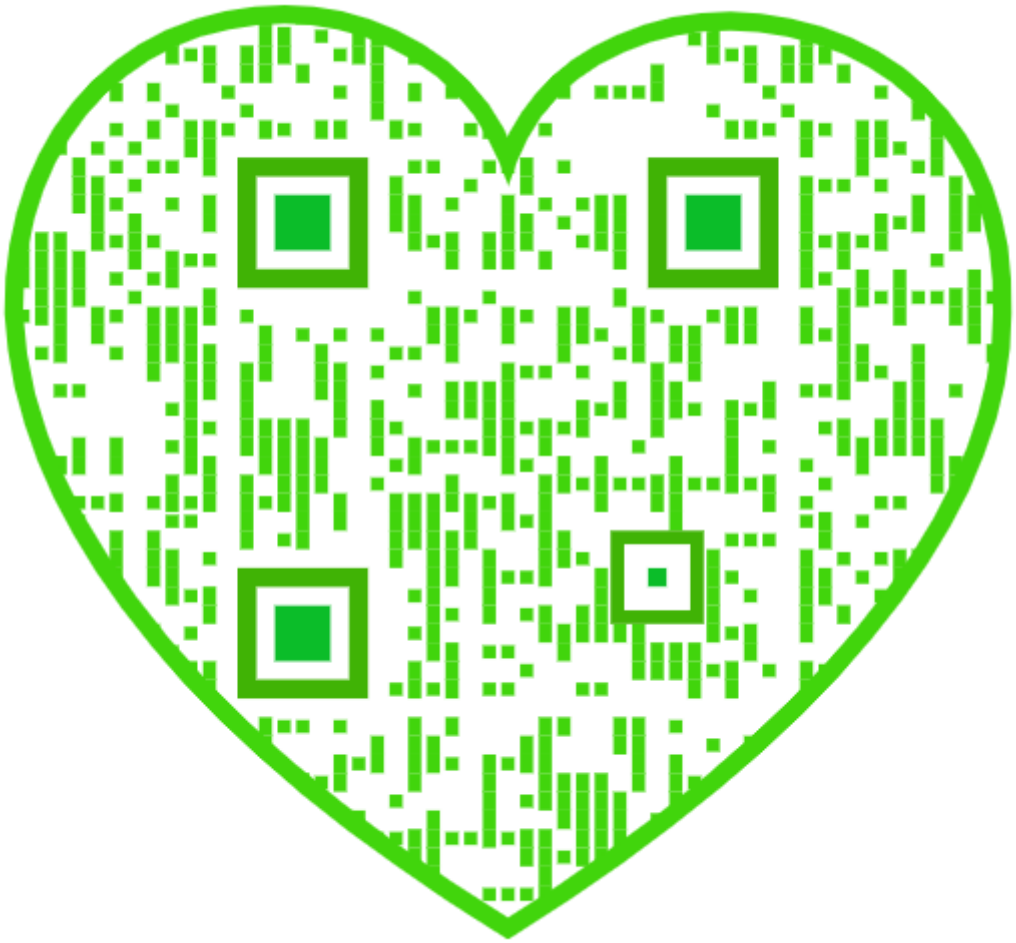
ST. PIERRE, MARTINIQUE, AS IT APPEARED BEFORE THE ERUPTION OF JULY 9. THIS PORTION OF THE TOWN WAS ENTIRELY COVERED BY THE ERUPTION OF THAT DATE. CROSS INDICATES MONT PELÉE.



Photographs Copyright 1902 by E. C. Rost.

THE ERUPTION OF MONT PELEE ON JULY 9, FIRST STAGE SHOWING CAULIFLOWER EFFECT OF THE CLOUDS OF STEAM AND DUST.—[See page 106.]

© 1902 SCIENTIFIC AMERICAN, INC.



SCIENTIFIC AMERICAN
ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ..... $3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Monthly (Established 1885) ..... 2.50 "
Scientific American Export Edition (Established 1878) ..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, AUGUST 16, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

NEEDLESS ANNOYANCES IN FERRYBOAT TRAVEL.

Although the ferryboat system of New York city is probably the best in existence, it is marred by a few serious drawbacks which the companies could easily remove if they set about to do so. In each case the trouble, which amounts to a positive nuisance, results from the extensive use of the ferries which is made by horse-drawn vehicles. We refer, in the first place, to the preventable and extremely annoying delays which occur at periods of high tide, owing to the inability of overloaded teams to mount the hinged bridges connecting the shore with the ferryboats, and in the second place to the intolerable odor which, in hot weather, pervades the wagon drives which extend through the central gangway of the boats. Primarily the delay which occurs when stalled teams are being coaxed up the incline is due to the fact that they are grossly overloaded; but since overloading unfortunately seems to be an evil that is going to stay with us, it is the duty of the ferryboat companies to provide some means by which a stalled dray or wagon can be assisted onto the boat. This might be done either by providing an extra hand-winch on the ferry pier and a snatch block on the ferryboat, so that a rope could be run to the boat and back to the wagon, and the team assisted up the ferry slip by the operators who warp the boats to the slip; or, a small steam winch (of a few horse power) might be placed at the front end of each engine house of the ferryboats for use in emergencies of the kind.

The unsanitary condition of the carriage and wagon driveways is altogether inexcusable, since it is entirely owing to the fact that wooden floors are used where asphalt or some similar impervious material should be laid down. If an asphalt surface were provided and a length of hose connected up in each gangway, the surface could be kept perfectly sweet and clean, and a nuisance which at present calls loudly for the interference of the Board of Health would be at once abated.

NEW METHOD OF ARMOR PLATE MAKING.

A new process of super-carbonization, or "face-hardening" of armor plate has been developed by an officer in the American navy which promises to exert a greater influence upon the struggle for supremacy between guns and armor than was produced either by the American Harvey, or the German Krupp processes before it. The method of increasing the resistance of homogeneous armor plate by hardening its face may be said to have originated in this country when Harvey introduced his process of increasing the hardness by causing the surface of the plate to take up an excess of carbon during treatment in the furnace. Armor with a hard face upon a tough back had, it is true, been already produced abroad, the compound armor, which so many of the old English battleships carry, being of this character. But compound armor had the serious defect that the hard face consisted of a separate plate of steel welded upon a backing of softer and tougher metal. The hard face was secured at the expense of homogeneity, and the serious nature of this defect was realized at the proving grounds when the surface flaked and broke away from the softer back, leaving the plate open to penetration by shells of small caliber. The incontestable superiority of the Harvey armor led to its all but universal adoption throughout the world. Krupp eventually improved upon it, substituting gas treatment in place of the layer of carbonaceous material used in the Harvey method, and also improving the quality of the plate by very careful attention to the details of the furnace treatment. While the high quality of Krupp plate is unquestionable, its excellence is gained at enormous cost, as high as $550 per ton having been paid for this class of armor.

The invention of Lieut. Cleland Davis, of the navy, marks, both in effectiveness and in cost of manufacture, a great advance upon the Krupp system. His method includes the substitution of electrical currents for the heat of the gas-fired furnace, and the direction of these currents against the face of the armor plate while it is in a heated condition by means of massive carbon anodes, in form not unlike the carbons used in arc lights, but of vastly greater size. During his course of experiments, Lieut. Davis found that if a current of electricity were sent from a carbon into the surface of a plate, it carried with it a certain amount of the carbon and implanted it within the body of the metal. The depth of the hardening is determined by the period of time during which the current is applied, and it is claimed that not only is the surface thus treated harder than that treated by the Krupp process, but the depth to which the hardening is carried is increased. The economy of the process may be judged from the statement that while the Krupp plate is kept in the soaking pits at a red heat for from fifteen to twenty days, the same amount of impregnation with carbon is obtained with the Davis process in five hours.

The experimental plate was made at the works of the Bethlehem Steel Company. A moderate thickness, five inches, was chosen, and the only complaint made against the quality of plate was that the hardening of the face was not uniform, a fault which is attributed by the inventors and makers entirely to the experimental nature of the electrical appliances employed and not to any inherent defect in the process. In the next plate that is fabricated, carbon rollers are to be substituted for the present anodes, and with these it is expected that a uniform depth and hardness of carbonizing will be secured. It is estimated by Lieut. Davis that as compared with Krupp plate of equal resistance, the new system will produce plates from 20 to 30 per cent lighter in weight. Further developments of this process will be watched with the greatest interest, and should it prove possible to secure these remarkable results on a commercial scale, the effect upon warship construction will be more radical than anything that has happened in the naval and coast defence world for many years.

It is possible that in the new plate the navy has made answer to the new army high-explosive shell.

MID OCEAN WIRELESS TELEGRAPH STATION.

A scheme is on foot in Liverpool which, it is claimed by the English shipping journals, will soon be in commercial operation for utilizing wireless telegraphy in a mid-ocean post office and signal station. It is the intention to permanently moor at a point 110 miles west of the Lizard a ship which will be equipped with a search-light and a complete set of Marconi apparatus. As the water at the point selected will involve the use of a mooring chain 400 or 500 feet in length, the weight of which would prevent the bows from riding buoyantly over the heavy seas, the vessel will be provided with a horse-pipe placed in the keel of the foremast. The search-light is to have a vertical beam for the purpose of illuminating the clouds and enabling the floating post office to be picked up at night from a distance of 60 miles or more. As the vessel will be located in the fair way of the English Channel, it will be advantageously placed for the distribution of orders sent from shore by the owners to vessels which are passing in or out of the Channel. Thus a ship coming in from the west or from the south could be directed as soon as it picked up the station, to proceed either to Liverpool, Bristol, or an English Channel port. By this means pilotage and port dues would be reduced, and, of course, there would be a considerable saving of time. The vessel will serve as a floating station, which can be approached in any state of the weather, and picked up for wireless communication. The value of this form of post office is expected to be very great. Moreover, lying at the junction of the three great thoroughfares of British and continental marine traffic the station should prove particularly valuable in salvage work. The scheme on the face of it appears to be thoroughly practicable, and if carried out it should prove to be of considerable service in the maritime world.

SOME FURTHER GUNNERY EXPERIMENTS WITH THE "BELLEISLE."*

BY OUR ENGLISH CORRESPONDENT.

The Naval Department of the British government has carried out further elaborate gunnery experiments with the obsolete battleship "Belleisle," to ascertain the relative penetrating power of modern projectiles discharged from heavy guns, and the resisting power of modern armor. This is the third test of a similar character carried out by the British Admiralty during the past two years, and much valuable data, otherwise unobtainable, has been gathered. Naval experts and theorists have maintained that the armor generally employed for protecting battleships is proof against gun-fire as it will be delivered under battle conditions, but these practical tests have conclusively proved that the balance of power is yet distinctly in favor of the gun. That is to say, the progressive development of the weapon in respect to velocity, weight, and explosive potency of the shell is superior to the protective armor, and that the thickness of the latter, and its resisting qualities, have not developed commensurately with the improvement of the former. The effect has been of far-reaching importance to the British authorities, since owing to the results obtained with the two previous experiments with the "Belleisle," which were duly and fully related in the SCIENTIFIC AMERICAN at the time, several important alterations have been made in connection with the armor belts and deck defences of the latest English war vessels. For instance, the second experiment unexpectedly proved that the 4-inch armor was quite easily penetrated by 6-inch projectiles. This thickness of armor had been already fitted or ordered for several of the new cruisers. The authorities at once altered the protection for the new vessels to 6-inch armor.

For this latest experiment the "Belleisle" was once more patched up, and placed in a condition similar to that which would exist in an actual naval engagement. An ammunition hoist replete with electrical fittings and trucks was placed in precisely the position relative to the armor which it would occupy in action. The hoist was erected in a battery behind compound armor. The object of this particular arrangement was to enable the Admiralty to ascertain exactly what would ensue if a shell exploded in the vicinity of the ammunition hoist, and how far the machinery of the latter would be deranged by the force of the explosion.

The test was also undertaken to illustrate one or two other important points in connection with naval gunnery, upon which there is considerable divergence of opinion, and also to determine whether certain innovations in connection with projectiles and charges recently carried out in the navies of the various powers are advantageous. For example, England still adheres to cordite as a propelling charge, while other powers employ nitro-cellulose powder. Also, the Johnson cap is regarded dubiously by the British naval authorities. It has been contended that these two acquisitions have resulted in great efficiency and superiority in certain navies. The United States 100-pound projectile, discharged with nitro-cellulose powder, gives a muzzle velocity of 3,000 feet to the missile, as compared with 2,400 to 2,600 feet obtained with a cordite charge, and the former shell with a Johnson cap will penetrate over 10 inches of armor, while its penetration is several inches less without this cap.

Another important feature of the trial was to ascertain the efficiency of a new explosive, similar to maximite, which has been introduced into the British navy as a shell filler.

The "Belleisle" was towed from Portsmouth and anchored off Bembridge as before. Two gunboats, one carrying a 6-inch gun, and the other a 9.2-inch weapon, were selected for firing. The first gunboat stood off at 1,000 yards from the "Belleisle" and fired a shell from the 6-inch weapon, the precise point of attack on the target being the exposed starboard central battery. The shell crashed through the torpedo netting, and pierced the side of the "Belleisle" just above the water line. The armor belting at this spot was of compound type, in vogu twenty-five years ago. A moment after the shell disappeared through the side of the vessel there was a terrific explosion, and a huge column of black dust was hurled high into the air, proving that the shell had penetrated to the coal bunkers and had there exploded.

Another shell was then discharged from the 6-inch gun. The point of attack this time was the conning tower. The shell struck with precision, as the white paint indicating the mark was completely blotched out. The next 100-pound shell was fired at the central battery. A great column of dust was blown into the air, and fragments of steel and splinters of wood were thrown to a distance of 200 yards.

The fourth 100-pound shell was fired at the conning tower, but it did not cause any serious damage so far as could be ascertained from an external examination.

The 9.2-inch gun was then brought into action, and a 380-pound shell was fired at the hulk from the same range of 1,000 yards. The first shot was directed at the central battery. It tore a big hole in the compound armor, and exploded with such violence that the "Belleisle" listed heavily.

A second 380-pound shell was then fired at the conning tower, with the result that the deck was torn up for several yards, and the bridge, situated just above

* The following account of the "Belleisle" trials makes no pretensions to give any detailed account of the destruction in the interior of the vessel, but is merely a description of the purpose and scope of the trials, and the effect of the gun-fire as seen by our correspondent from the outside of the cordon of vessels which was established by the government around the "Belleisle. It is impossible to secure any detailed facts regarding the condition of the ship after the attack for the reason that the Navy Authorities have taken elaborate precautions to prevent such facts becoming public.

© 1902 SCIENTIFIC AMERICAN, INC.

the tower, was completely torn from its position and twisted into a fantastic wreck.

Two other shells—a 380-pound and a 100-pound, respectively—were then fired at the central battery; but at this juncture the vessel was so battered that the damage caused by successive shells could not be ascertained, and the trial was brought to an end.

Upon the conclusion of the trials the "Belleisle" was inclosed in canvas to conceal the results achieved and towed into Portsmouth dockyard, where she was dry-docked and a thorough examination was made by the naval officials. The "Belleisle" is to be again patched up for further trials with torpedoes.

HOW OSTRICH FEATHERS ARE CULLED

News comes from California that ostrich farming is now a paying industry. About this season of the year many people from Los Angeles go out to the farms at South Pasadena to watch the plucking of the feathers. To many in the East the plucking of ostrich feathers is probably associated with a violent laying on of hands and a tying down of the bird. As a matter of fact, the gathering of the feathers is a very delicate task.

When the time comes a man carefully examines the flock, and picks out those birds whose feathers are ripening, groups them into dozens, and pens them in, so that they cannot run about and injure their beautiful plumage. When the plucking time comes, the bird is enticed into a narrow, dark passageway. The entrances are then closed and the bird thus imprisoned. A cloth bag is thrown over the creature's head. Then the plucking begins. Three men, perched upon platforms without the pen, reach over the board inclosure and with curious scissor-like appliances pluck off the feathers. Whatever wounds a bird may receive are immediately dressed. The tail feathers are pulled and not cut, simply because they reproduce better than other feathers of the ostrich. While the plucking is in progress the ostrich keeps up a dismal roaring. Were it not for the staunch construction of the pen the creature would kick the boards into splinters.

The first plucking is the most valuable. For that reason the older ostriches are kept simply as breeders.

How successful is the ostrich industry in Southern California may be gaged from the fact that about three-quarters of a million dollars are now invested in it, and the annual output of feathers is worth about $100,000.

MILITARY PHOTOGRAPHY.

Nearly all European nations have had a share in the development of photography in the last ten years, considering it as an important adjunct to the army in both peace and war. During the Spanish-American and South African wars photography was greatly in evidence, and correspondents fairly besieged every fighting force, carrying with them cameras to take pictures of everything of interest to their papers. So remarkable was this outbreak of war photography that the country was flooded with photographs of the war, some of considerable value and others of little use or interest to any. Nevertheless, the actual photographs of the different scenes of the war published in the illustrated papers furnish a fairly accurate history of the most dramatic events, and readers of the future can look back upon those stirring times and gain a far more correct idea of the conditions of the countries and armies than if no photographs had been taken.

But this sort of photography is very different from that undertaken by the war departments of the various nations for purely military purposes. An immense number of photographs of an official nature were taken and developed during both of these recent wars, and these form a part of the regular reports. The general public seldom see these pictures or their reproductions, and there would be little in them of actual interest to the average reader if published. The pictures consist not so much of dramatic events and battles as of dry details of military roads, bridges, breastworks, and photographs taken of the surrounding country from balloons. They are intended to show the nature of the country in which the battles were fought, and the character of the progress made by the army in its invasion. In other words, these official photographs are supposed to illuminate the reports of the officers, and to verify statements concerning the plans and developments of battles. They take to a certain extent the place of military diagrams, which formerly accompanied official reports.

Military photography thus becomes an important part of a campaign. The pictures show the condition of troops at certain critical moments, their arrangements, the condition of the country, and technical points that cannot be illustrated in any better way. During a campaign through an enemy's country the camera in a balloon helps to unfold matters of great importance to one commanding the invading army. During the South African campaign the British time and again obtained their most correct maps from the photographers who took bird's-eye pictures of the country from the cars of balloons. Telephotography became a science that yielded important results to the British commanders in invading a land so little known and so full of pitfalls.

While the South African and Spanish-American wars brought military photography peculiarly to the front, they were not by any means the first wars in which the camera was employed. Most of the European war departments had official photographers attached to the different armies ten and fifteen years ago. In the Abyssinian war England had a corps of official photographers, who provided the commander with pictures of the country around. These photographers accompanied and preceded the army to take photographs of the country for miles in advance, and the commander was thus enabled to study out his march with more accuracy. As early as 1886 there was a field photographic department attached to the English army which performed excellent work for the surveyors. At the Royal Naval College at Greenwich there was a photographic course which enabled officers to learn the mysteries of photography. Every war vessel carried a complete photographic outfit and a dark-room for developing. Since photography has taken rapid strides in improving the process, the English army and navy have broadened their work in this field, and to-day the corps of photographers connected with both navy and army number several hundred.

Russia did not organize a photographic department for army services until the military balloon came into practical use. Then realizing the importance of taking accurate pictures of the surrounding country from the balloon, a corps of expert photographers was organized in 1884 for co-operation with the balloon sections of the army. Since then the department has increased and broadened rapidly, and to-day photography is an important adjunct to the military educational system. There are some dozen or more officers in the army who are experts in this science, and they are masters of all the details of engineering and military science, so they know how best to photograph the country for technical purposes.

To France probably belongs the credit of using the camera for war purposes in a most satisfactory manner at a time when it was of the utmost importance. When Paris was besieged communication with the outside world was had only by means of balloons and carrier pigeons. The despatches sent by the carrier pigeons were photographed on small films, which could be attached to the feathers of the birds, and in this way a single bird could carry thousands of words. Likewise the aeronauts who hovered over Paris, and made the dangerous voyage through the air across the invading army's lines, used the camera for photographing the different positions of the Prussians. These photographs were the first ever taken of an invading army from a balloon. Profiting by this experience, the French army and navy have not only increased their carrier pigeon and balloon services, but they have made the most of photography. Several hundred officers in the French army are expert photographers, and every engineering corps carries with it complete photographic outfits.

Germany is also foremost in this field of military photography, and all the military schools teach the students how to avail themselves of this art. Every balloon corps carries with it photographers who are able to make perfect reproductions of the surrounding country. Italy organized a photographic corps in 1895. It has half a hundred men in the service, and pictures are constantly taken and exhibited for inspection by officers. The barracks, arms, fortifications, and topography of the country are photographed and sent to headquarters for examination. The Austro-Hungarian army and navy have likewise been provided with experts who understand the art of military photography, and all the naval and military schools emphasize the importance of this study.

Without exception all of the leading nations have adopted the camera as a part of every well-equipped army sent into the field, and to be ready for emergencies in times of war the experts are constantly laboring to make their department the most perfect. The engineering corps and the balloon sections in particular depend a good deal upon photography as an aid to their work. Scarcely a regiment of infantry or cavalry will in the next war go into the field without at least one officer or expert accompanying it to take photographs of important parts of the country.

The modern inventions in photography have naturally greatly facilitated military manipulation of the camera for technical work. The modern improved films are now used instead of plates, owing to their light weight and compactness of form. Magnesium lamps are provided for night photography, which sometimes proves the most important of any in reconnoitering. Special dark-room tents for developing the pictures are also provided, and neat, compact cases for carrying the different chemicals. The modern telephotographic attachments have naturally proved of almost indispensable value to the military photographers. By means of it pictures of the surrounding country can be taken at a balloon height of a thousand or two feet, and, so far as the details of the picture are concerned, they are almost as vivid and accurate as if taken fifty feet away.

The army bicycle corps is generally provided with photographic apparatus, and some of the European armies equip each company of bicyclists with cameras, and even send spices out mounted on wheels to snap pictures of the land. Small cameras are carried on the wheels, and they are intended for obtaining snapshots of the land over which the army is to travel. Incidentally, if any sharpshooter appears in the picture he is easily discovered when the picture is developed. For photographing rivers, mountain gorges, and dangerous trails through a new country by an advance corps of engineers or guides, the camera is decidedly important in its ultimate results, and its future usefulness in this direction will continue to increase.

G. E. W.

THE AMOUNT OF WATER USED IN IRRIGATION.

The Office of Experiment Stations, United States Department of Agriculture, has just issued an interesting and valuable report of its irrigation investigations for 1901. It is handsomely illustrated by twenty-five plates and twenty-nine text figures. In it are given the results of the year's measurements and studies of a large number of leading irrigation experts of the arid region, acting under the direction of Elwood Mead, Chief of Irrigation Investigations, among whom are: A. F. Doremus, State Engineer of Utah; D. W. Ross, State Engineer of Idaho; Prof. O. V. P. Stout, of the University of Nebraska; Prof. J. M. Wilson, of the University of California; Prof. O. L. Waller, of Washington; Prof. Samuel Fortier, of Montana; Prof. J. C. Nagle, of College Station, Tex., and W. H. Code, of Arizona, recently appointed Inspector of Irrigation Surveys in the Interior Department, all of whom are resident agents of those investigations in their respective States.

Prof. Mead, in his introduction, speaks of the nature of the work being carried on and the importance of a general knowledge on this subject, for which purpose the bulletin has been written. He speaks of the growing demand for the construction of irrigation work by government aid, and that prior to such construction the government authorities should know how much land can be reclaimed by each proposed enterprise, and that precautions should be taken along this line to prevent mistakes which might seriously retard the development of the West for many years. This is followed by the discussion of the experts above mentioned.

All have made a careful and painstaking investigation and, although they deal with phases of irrigation typical of their own States, the conclusions of all are exceedingly interesting and will be carefully studied by Western farmers and all interested in the development to be inaugurated under national aid.

Mr. D. W. Ross, State Engineer of Idaho, calls attention to the increased duty of water, which is being brought about by a modification of water right contracts. Mr. Ross has given considerable attention to this reform and, owing to his efforts and others connected with this investigation, canal companies are substituting contracts in which the water is measured to the farmer and he pays only for what he uses, in place of the earlier contracts where he was charged for the acres irrigated. In this way the farmer is led to economize because he gets the benefit of his savings. Changes of this kind have increased the need for more accurate methods of measuring water, hence the designing of cheap, efficient water registers has been given much attention by this branch of the department, and a number of new patterns have been invented and are now being furnished to irrigators by some of the leading instrument makers of the country at very reasonable prices.

The duty of water is the leading subject dealt with in all the reports, although each paper discusses the local practice of the region where the measurements were made. These are reviewed in the discussion of the amount of water needed to irrigate an acre of land, by Clarence T. Johnston, Assistant Chief of the Investigations. It shows that the average depth of water being applied to irrigate fields is more than four feet, being 4.35 feet in 1899, 4.15 feet in 1900, and 4.60 feet in 1901. Measurements like these are necessary in order to determine how much land can be irrigated from the reservoirs which the government is to build, and also what will be the value of the water stored in them. Without this information serious errors might be made as they have been made in the past, either because of allowing more water than was needed or in attempting to irrigate too many acres.

The report is in four parts, any of which can be had by applying to the Director of the Office of Experiment Stations, United States Department of Agriculture.

© 1902 SCIENTIFIC AMERICAN, INC.

A SMOKELESS AUTOMATIC STOKER.

It was with much interest that we accepted an invitation to witness the practical operation of a successful automatic coal stoker and smoke consumer actually applied to the well-known form of a Babcox & Wilcox water-tube boiler at the Stevens' Institute in Hoboken, N. J., where careful scientific tests have been made covering a period of over two months. It was especially gratifying to note that not a particle of smoke issued from the smokestack.

The stoker and furnace is the invention of Mr. Frederick Girtanner, and is exhibited, manufactured

AUTOMATIC STOKER FOR SMOKE CONSUMING FURNACE.

and applied to any boiler furnace by the Peerless Automatic Smokeless Stoker Company, No. 11 Broadway, N. Y.

The upper engraving presents an external view of the stoker as applied to the Stevens' Institute boiler in Hoboken.

It will be noticed there is an adjustable hopper filled with soft coal, and below a traveling endless grate feed-apron substantially air-tight, which is operated at an intermittent speed by a ratchet movement that carries forward from beneath the bottom of the coal heap a fixed amount of fresh coal to the interior.

Referring to the lower engraving showing a longitudinal section, it will be observed that as the coal is drawn in at the front no air is admitted. At this point the reflected heat from the intense fire at the rear bakes or cokes the coal as it enters the chamber, driving out the gas as in the process of gas manufacture, which, as it comes in contact with the fire beyond, is ignited and complete combustion is secured; as the coked coal is carried further to the rear it burns on the step-inclined grate in a smokeless flame, and is maintained at an intense heat by the draft of air passing through it; thus the full heat-giving efficiency of the fuel is obtained and nothing is lost.

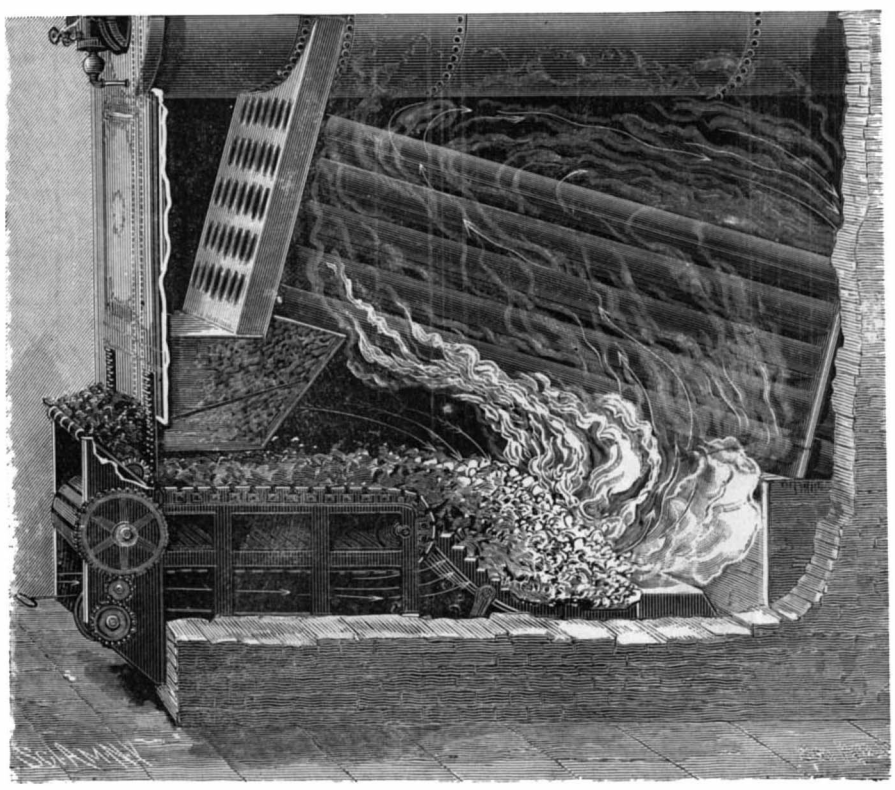
The inclined grate hinged at one end is occasionally swung back and forth automatically by a lever operated in connection with the feeding mechanism at the front and serves to slice or break up the fire, permitting a free circulation of air through it. The ashes fall from the inclined grate to a rear platform grate hinged at its rear, and from which the ashes are easily dumped into the ash pit below.

The practical efficiency of the stoker and smoke consumer over the ordinary method of hand firing is shown by the results obtained not only at the Stevens' Institute but also at a brewery in Guttenburg, N. J., where it was found that 10.20 pounds of water at 212 degs. Fahrenheit was evaporated with 1 pound of coal, as compared with 8.24 pounds of water to 1 pound of coal by the old methods, demonstrating a saving of 20 per cent. In the automatic stoker 480 pounds of ashes and clinkers were left as against 1,123 pounds in the old method. The double utility of this device in effecting economy in fuel and an elimination of smoke commends it to all users of soft coal.

Skillful Mending of a Propeller Shaft.

A clever engineering feat was accomplished during a recent voyage of the British steamship "Baroda" from Algoa Bay to Batavia, in connection with the repair of a fractured shaft while at sea. The vessel left Algoa Bay with a light cargo, and was therefore down at the head, which resulted in the propeller racing considerably more than if she were well down in the water, during rough weather. On the eighth day out the vessel ran into a gale, and during the evening the chief engineer, Mr. J. G. Shepherd, when entering the shaft tunnel noticed an eccentric movement, accompanied by a peculiar sound. The engines were stopped, and an examination of the shaft resulted in the discovery of a severe fracture at the after end of the third length of the shafting, 2½ feet from the coupling, and which extended into the holes of the first and fifth bolts. The engineer immediately set to work to repair the fracture to save the propeller, and as there was no special hurry, cut away the plating of the roof of the shaft tunnel over the injury, in order to obtain light and room to carry out the repair thoroughly. Closer inspection proved that the fracture was such that it could not be closed, so it was made solid with steel wedges, the crevices between which were afterward filled in with Parsons white brass. A number of 3-foot steel plates happened to be on board, and these were clothed round the fracture. This operation satisfactorily accomplished, the engineer proceeded to bind the shaft at the point of fracture with 360 fathoms of 2¾-inch steel wire rope. The wire rope was passed round a winch, and one end secured to the shaft by two 1-inch bolts and ½-inch plate washer. The engines were then set running slowly ahead, drawing the wire rope from the winch, with steam full against it, by which means the desired tension and strain were secured. The wire was carefully followed and tapped round the shaft as the binding proceeded. The rope was bound round the shaft in two layers and carried over the couplings. Progress was necessarily slow to insure the operation being carried out skillfully. So satisfactory, however, was the work performed, that the vessel steamed over 1,000 miles with this repair, and through exceptionally heavy weather; on one occasion she had to heave to for 24 hours until the sea moderated.

The British Zoological Society has been presented by the King with a remarkable zebra hybrid which was sent to His Majesty from South Africa, and is one of the most valuable acquisitions of the society in recent years. In appearance it resembles a small pony, and the color of the body of the animal is brown, lightening to bay on the head and legs. The striping is peculiar. The marks on the barrel are nearly vertical, as are those on the cheeks, while the limb markings are horizontal to the hocks, below which the color is black. On the flanks the stripes are arranged in small patches. The nostrils are black, and between the eyes the markings faintly resemble those of a Burchell zebra, but between this part and the nostrils the color is bright bay. The dorsal stripe is peculiar, tapering toward the tail. It is officially described as a pony bred from a cross between a zebra and a pony.



THE GIRTANNER AUTOMATIC SMOKELESS STOKER.

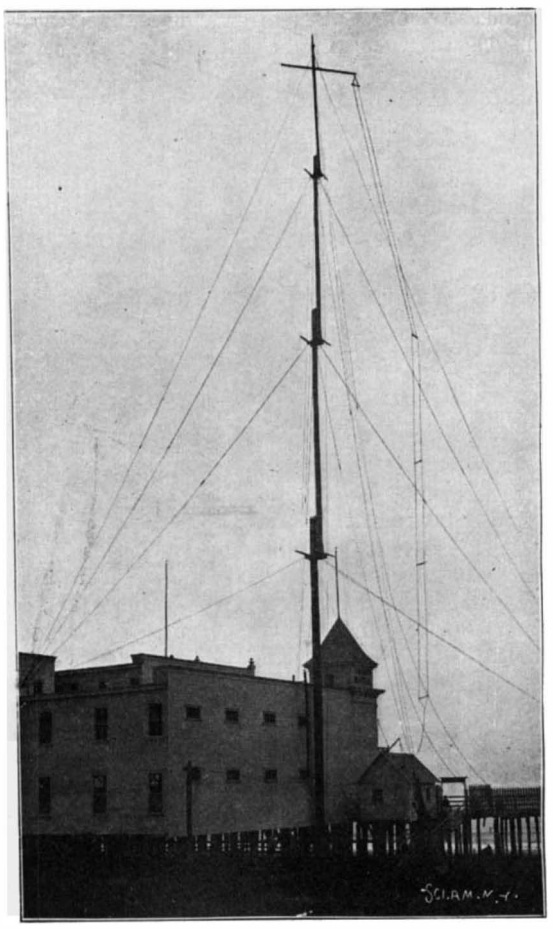
THE DE FOREST SYSTEM OF WIRELESS TELEGRAPHY.

For several months now a regular interchange of wireless telegraph messages has been maintained by the De Forest Wireless Telegraph Company between their stations near the Battery in New York, and at Staten Island.

The history of the inception of the new system is interesting. In 1899 the inventors began the search for a new receiver for use in wireless telegraphy, one possessing that much desired quality of auto-sensitiveness. From the first the necessity for tapping the old coherer to restore it to sensitiveness, the complicated apparatus thus involved, the uncertainty of its action, and the slow speed of word-transmission necessitated, has called for a better, simpler, quicker receiver than that of Branley's.

Starting on this quest various principles were tried, at first without satisfactory results. The device lacked either sensitiveness or reliability. None of the so-called "auto-coherers" filled the bill. During the year following Dr. De Forest carried on his researches in this field in the laboratory of Armour Institute, kindly tendered him for this purpose. There he received the assistance of E. H. Smythe, of the Western Electric Company, and the responder is the result of their combined effort.

The new receiver, or "responder" as it is aptly called, depends on an electrotypic principle for its action. The field of investigation was entirely new, no data existed on the subject, and the present state of commercial practicability attained, together with the complete theoretical study of the action involved, represents years of the closest, most painstaking work on the part of the inventors. The United States Patent Office has granted them very broad claims on the principles involved, and upon the issuance of the papers one will expect highly interesting contributions to the science.



CONEY ISLAND STATION OF THE DE FOREST WIRELESS TELEGRAPH. HEIGHT OF MAST 210 FEET.

During the past year Dr. De Forest has greatly increased the sensitiveness of the responder, while maintaining its great simplicity. For example, the receiver will respond with absolute certainty and regularity to a spark of one sixty-fourth inch length from a small coil forty feet distant, driven by one cell of storage battery with a two-foot antenna at receiver and coil, and without ground connection.

The De Forest transmitter does away with induction coils, all interrupters, and make-and-break devices, as it has been found that a large per cent of uncertainties and failures in wireless messages is due to the imperfections and irregularities of these devices. A special key very like the ordinary Morse key has been devised with a view especially to high speed work. The make-and-break is under oil and the operator is fully protected from contact with high voltage wires. By virtue of the automatic quality of the responder it is possible to use a telephone in circuit with the device, and the employment of a relay is rendered unnecessary. By this means a speed of forty words a minute can be obtained, and under ordinary circumstances a speed of twenty-five to thirty words is regularly accomplished. One hears in the telephone as it were the sound of the sending spark, be this a high or low fre-

© 1902 SCIENTIFIC AMERICAN, INC.

quency, in dots and dashes. An ordinary Morse operator can learn to read with the new apparatus with a few days' practice. The sending requires no special knack other than a firm touch, with dashes clean cut.

Although, as the illustration shows, the operator reads from the head telephone, a relay or recording device can be substituted therefor; only there is always this condition, that, inasmuch as the responder, unlike the coherer, is a *quantitative* device and the telephone and ear the most sensitive signaling device known, at the extreme range messages can be clearly read which are altogether too weak to operate any relay. Thus, through the extreme sensitiveness of the responder, an operator with head telephone can receive messages many miles further than a coherer (all other arrangements at transmitter and receiver being the same) can record them. In proof of this it is interesting to cite the test of February 22, when signals from the "Etruria" were heard at the Jersey City station, from a mast but thirty feet above the roof, when the steamer was fully ninety miles distant. This was without any "jigger" or transforming device whatever at the receiving end, and represents an astonishing degree of sensitiveness in this new "responder."

By virtue of the automatic quality of the receiver, whereby the sound impulses as heard are identical in frequency with that of the transmitter spark, the relay or "call" in use employs a reed attuned to a certain frequency per second. Thus only when the calling station uses a frequency of spark in tune with this reed will the "call" respond and summon the listening operator. The opportunity this feature gives to the system for a *mechanical* or acoustic syntony, in distinction from and in addition to the electrical syntony is highly significant.

During the last month a regular station and school for operators has been opened by the De Forest Company on the roof of the Cheeseborough Building, 17 State Street, New York. Here, as shown in the illustration, is a house built of glass over an iron frame, and fully equipped with sending and receiving apparatus. The antenna here is sixty feet in height. The companion station is located at Hotel Castleton, Staten Island, the first hotel in the world, by the way, to be equipped with a wireless plant.

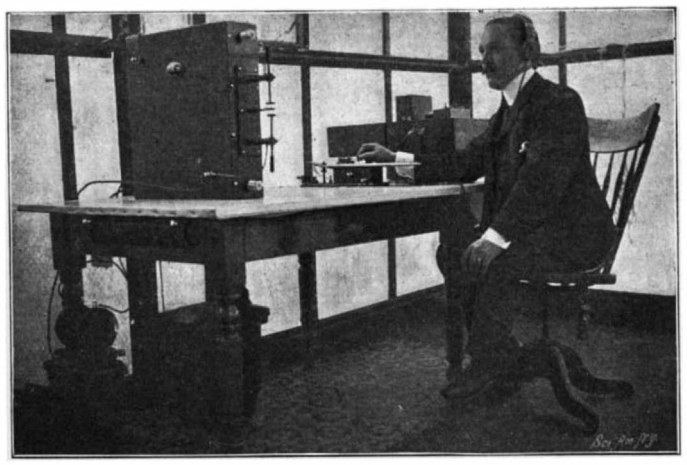
The most important land station yet established by the De Forest Company is that at Steeplechase Park, Coney Island. This enjoys the distinction of having the tallest mast in America, a fine stick of four pieces, standing 210 feet high. This station is supplied with 60-cycle alternating current, at 110 volts, from the Edison mains. This is stepped up in two transformations to 25,000 or 50,000 volts, as desired, and applied direct to the spark terminals. These latter are of special construction and connected with the condensers give a spark of exceptional clearness and power.

On June 14, the first day the Coney Island station was operated, the first communication with a vessel equipped with the De Forest system was also established. On the Ward Liner "Morro Castle," bound for Havana, a moderately high (60-foot) antenna had been rigged, and transmitter and receiver installed, and messages to and from ship and shore were exchanged, until the vessel was fifty miles from port. The Staten Island station kept up a lively exchange of messages until the boat reached the Narrows, when she called off, and the Coney Island station picked her up.

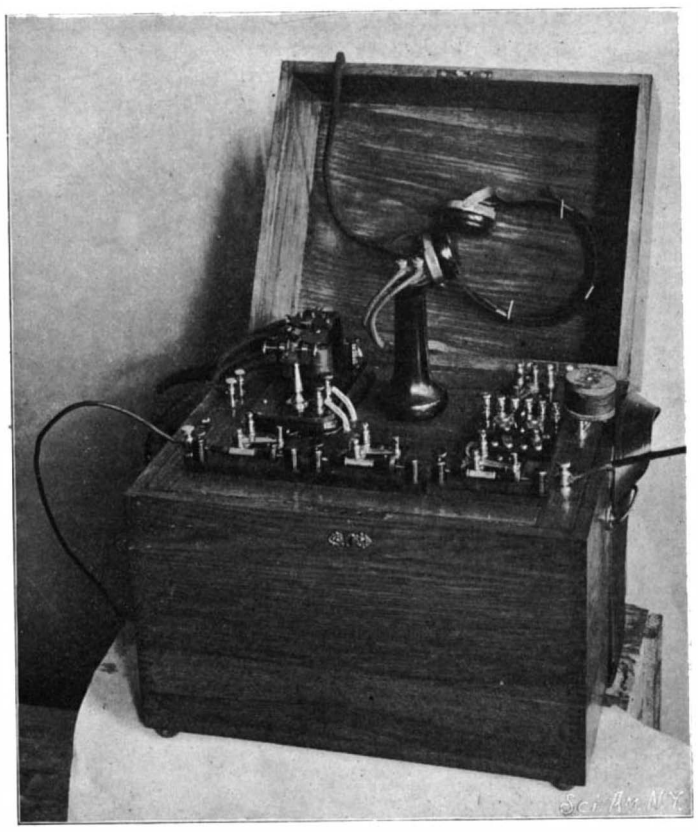
The De Forest Company has secured desirable land near the government light-house at Montauk Point, and proposes erecting a station there at once, as well as others at important points along the coast.

During the last week two operators of the De Forest Wireless Telegraph Company accomplished a feat which, while new in the annals of wireless telegraphy, is only significant of the possibilities before the "responder" or automatic receiver in combination with the telephone.

At the 17 State Street station, this city, two messages were received and read simultaneously by the two operators, listening in on two separate telephone



INTERIOR OF A NEW YORK CITY DE FOREST STATION.



THE DE FOREST RECEIVER.

receivers, attached to one and the same responder, and without any special attuning or syntoning device in circuit. One message was from the Staten Island station and was sent quite rapidly, thirty words per minute, with a high-frequency spark (120 per second). The other was from some foreign station, probably a Marconi installation. The speed was about ten words per minute, sent with a low-frequency interrupter.

Mr. Horton concentrated his attention upon the Staten Island message, while Mr. Barnhart was able to pick out by their peculiar drumming sound the signals from the other station.

The result is no more remarkable than the fact that two conversations can be carried on simultaneously over the same telephone wire, if the two voices differ considerably in pitch and timbre. But the fact that without any tuning device this can be accomplished with one and the same responder certainly demonstrates the advantage of the telephone receiver over any sounder or tape-recording device, and the greater immunity of such a system from atmospheric and foreign disturbances.

Osier Culture.

BY GREY E. MITCHELL.

On many farms where there is some water front, land otherwise waste can be profitably used for osier culture. While willows will grow almost anywhere, they should be planted for greatest profit in a deep sandy loam, well drained and thoroughly prepared. The ground should be level and moist, but there should be drainage. However, willows will grow in a comparatively dry soil, but the whips will be smaller, though tougher and more durable than when grown in a rich, moist soil. The growth under moist conditions is naturally more vigorous and much more rapid. According to Dr. B. E. Fermow, Professor of Forestry at Cornell, the best situation for free and rapid growth is along the banks of rivers and brooks which pass through a level country and on the small islands which frequently occur in the midst of streams. Hollows or swales, the soil of which is composed of rich, soft, earthy particles, and which can be laid dry, furnish eligible situations for conversion into osieries; if water can occasionally be diverted onto such lands during the dry summer months, the situation may be considered as perfect. There are at present thousands of acres of marshy lands in the country, Mr. Fernow states, not paying 2 per cent per annum, which, if drained at a small outlay and planted with willows, would yield an immense return, paying as high as 20 or 30 per cent profit. The willow reaches its greatest production in the third year, and with proper care and good cultivation it will continue to yield good results for a long run of years.

Willow baskets, hampers, chairs, etc., are a class of articles for which there is to-day an enormous demand. The manufacture in this country is increasing rapidly, but not sufficiently to meet this demand. Five cents a pound for dry willows is the price generally paid. At even a much less price there is a large profit in growing willows and an occupation is furnished for the winter months.

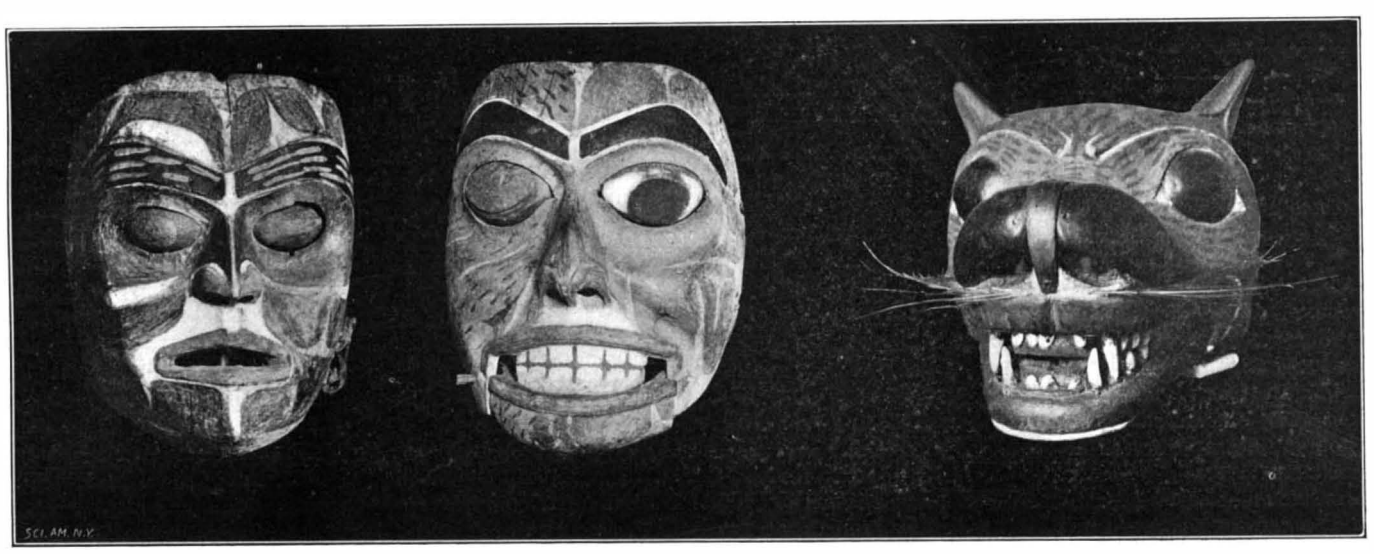
A GROUP OF INDIAN MASKS.

BY FRANK YEIGH.

The fondness of the American Indian for masks or false faces goes to prove that secret societies exist among the red men as among the whites. According to Iroquois belief, certain spirits, whose entity is comprehended in ugly visages, have the power to inflict bodily ailments and to cause diseases to afflict their people. To counteract their evil designs, the Society of the False Faces is maintained among the pagan Iroquois, in order to appease the evil spirits from whom they take their name, as well as to effect a charm against disease and to cure others. When a candidate is initiated into this strange society, the chief False Face thus addresses him: "Brothers, listen! Now you must know that we did not make this custom. The beginning is from Niyoh, our Creator, who is above the false faces. A member of the False Faces must go about among the people in the spring and fall to keep them from sickness, and must visit sick people at all times when called upon. This is all I have to say." Whereupon the new member replies: "I will act according to the ancient customs as advised by the leader of your Society, of which I am now a member."

In a report made to the New York University in 1852 Lewis H. Morgan thus describes the workings of this curious order: When any one was sick with a complaint

MASKS FROM BRITISH COLUMBIA. THE RIGHT-HAND MASK IS DECORATED WITH PORCUPINE SPINES.



MASKS WORN BY THE COAST INDIANS OF BRITISH COLUMBIA.

© 1902 SCIENTIFIC AMERICAN, INC.

within the range of their healing powers, and dreamed that he saw a False Face, this signified that he would be cured. A feast was then prepared, the False Faces appeared and, led by a female leader, marched in Indian file, each one wearing a mask and carrying a turtle shell rattle in the hand. On entering the house of the invalid, they first stirred the ashes upon the hearth and then sprinkled hot ashes over the patient until his head and hair were covered, followed by some manipulations over him ending with the sick person marching around the room with his queer visitors, so efficacious was the cure. The mysterious callers were then presented with food, which they took away and ate in secret, as they never unmasked themselves before the people. Among the simpler complaints which the False Faces claimed to cure were nose bleeding, toothache and sore eyes.

The accompanying picture of a hideous mask with a crooked mouth suggests the myth regarding it that for a long time, many centuries ago, there was no being of any kind on his continent but one False Face. One day the Creator appeared on the scene and told the solitary False Face that some other beings were soon to come into the world and it would be necessary for him to keep out of the way. The False Face objected to this, declaring that he had been in possession, and finally refused to be displaced. The Creator then told him that he must leave, and that a hard and fast line must be drawn between their territories, and ordered the False Face to turn himself away while this line was being marked out. The False Face, with exceeding bad grace, although looking in the opposite direction, yet gave sly glances sidewise, and at length turned almost around to inspect the drawing of the line, when he was detected by the Creator, who struck him such a blow on the cheek as to knock his mouth out of shape, and so it has remained until this very day, and the mask portrays the disfigured condition of the disobedient False Face!

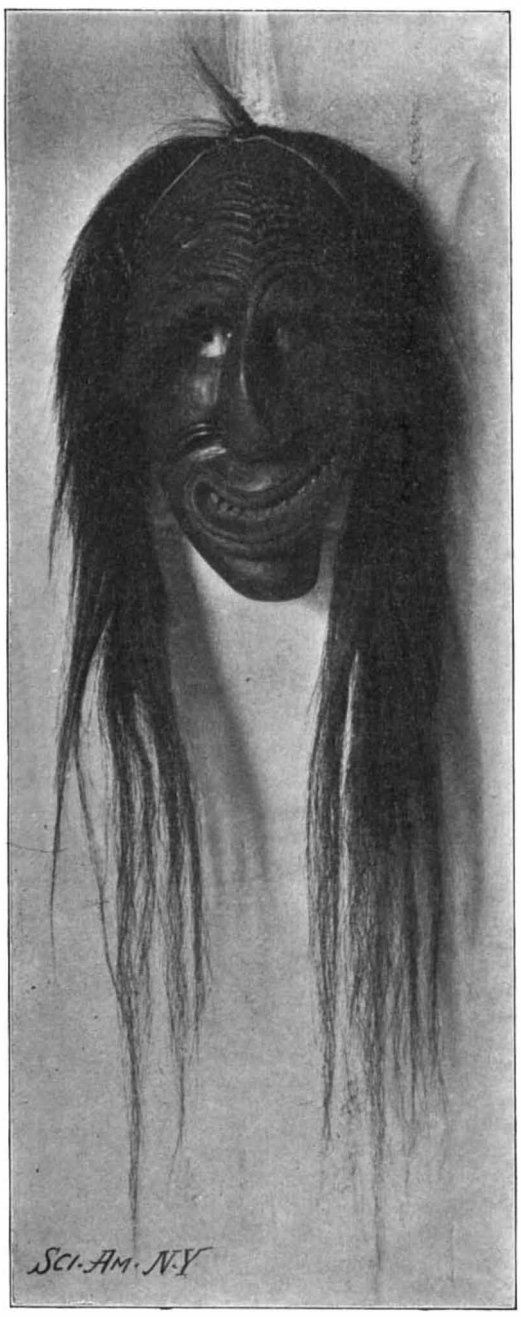
The accompanying illustrations depict curious mask work by the Tghimpsean tribe of Indians, on the Pacific coast of British Columbia, on Dixon Inlet and the Skeena River. They were secured by a Methodist missionary—Rev. Dr. Crosby—who labored among them, and these False Faces are now to be seen in the museum of Victoria College in Toronto.

Recent Advances in Civil Engineering.

At the annual meeting of the Institute of Civil Engineers of Great Britain Mr. Charles Hawksley, the newly elected president, delivered an interesting retrospect of the advance made during the nineteenth century in the more prominent branches of civil engineering. First dealing with the subject of waterworks he stated that, though water taken directly from rivers has of late years been regarded with suspicion, it was not improbable that rivers as a source of supply would again grow in favor, especially when the conditions of pollution and the safeguarding of the water by careful and efficient filtration came to be better understood and recognized. Many matters connected with water supply, which were unheard of at the commencement of the last century, are now of everyday occurrence, such as the treatment of certain waters with lime to prevent their action on lead communication pipes, the softening of hard waters, the construction of large depositing tanks to facilitate the deposit of matters in suspension, as well as to enable flood waters to be passed by during the earlier stages of a flood, in cases where the water was taken directly from a river, service reservoirs (in many cases covered to protect the water from the action of light and heat, a precaution more especially needed with certain waters derived from wells or taken directly from rivers), and lastly, but not least, efficient filtration through sand filters, a mode of treatment first introduced by the late Mr. James Simpson in the year 1828. As there still existed much misconception in regard to the quantity of water required for domestic purposes with a constant service, unrestricted use, except in respect to misuse and waste, Mr. Hawksley stated that, having recently had occasion to collect statistics on the subject from sixteen of the principal towns in England, he found that the quantity of water distributed for domestic and other non-metered purposes was on the average of six towns supplied by companies, having a total of 1,185,000 persons, 19 gallons per head per diem, and in the case of ten towns supplied by public authorities, and having an aggregate population of 3,961,000 persons, 18¼ gallons per head per diem. The foregoing quantities provided a constant service for all domestic purposes, including unmetered trade supplies and such waste as cannot be prevented.

Passing to gasworks the president remarked that some idea of the development which had taken place in the size of gasworks might be formed from the fact that whereas in the year 1822 Sir William Congreve, the Government Inspector of Gasworks, reported that at one of the London gasworks several of the gas-holders were each "of the enormous size of 40,000 cubic feet," and the London gas companies now possessed gas-holders having capacities of from 8,000,000 cubic feet to 12,000,000 cubic feet each. Coal gas was now used, not only as an illuminant, but also extensively for heating and motive power. Although for these latter purposes gas, as supplied to towns for illumination, was mostly employed for the sake of convenience, there were many instances in which, from considerations of economy, a specially-made gas of low illuminating power was used. The employment of gas of that nature was likely to become largely increased by the facilities and greater economy which doubtless would before long be afforded by the distribution of Mond gas, the manufacture and distribution of which had, during the present year, received the sanction of Parliament by the passing of the "South Staffordshire Mond Gas (Power and Heating) Company Act, 1901" having for its object the supply of gas (not to be used for illuminating purposes) in large quantities at a price of from 6 to 8 cents per 1,000 cubic feet.

It was at first anticipated by many persons that the competition of electricity would greatly reduce the value of, even if it did not entirely ruin, the coal-gas industry, but such had not proved to be the case, the effect of the introduction of electricity having been to reduce the rate expansion of gas undertakings. The competition of electricity had, moreover, proved



CROOKED-MOUTHED IROQUOIS MASK.

a stimulus to improvements in the modes of consuming gas, such as the incandescent burner, and had led to greater facilities being offered to the gas consumer, such as by the prepayment meter and the letting on hire of cooking stoves.

With regard to electricity the utilization of electric energy had opened out an entirely new field for the employment of civil engineers, and had established a new branch of the profession which has to deal with a subject of so varied, novel, and interesting a character as to have led to the formation, in the year 1871, of the institution of electrical engineers, which already numbered over 4,000 members of all grades, and which devoted its discussions entirely to electrical matters. The great advantages conferred on mankind by the development of electricity were accompanied by certain drawbacks. In the first place there was the undoubted disfigurement of British towns by overhead wires—a disfigurement which it is sought to justify on the score of economy, a plea which was not, in his opinion, a sufficient justification, and one which was not allowed to prevail in some other countries less wealthy than Great Britain. The placing of the wires underground would not only prevent that disfigurement, but would also remove the danger—not perhaps a great one, having regard to the comparative scarcity of the accidents that occur—attending the use of overhead wires. There is a great opening in connection with electric tramways for a good underground conduit system which could be readily applied in this country. Unfortunately the heavy initial capital expenditure required for the present conduit system as compared with that required for the overhead system had prevented its adoption in all but a few isolated cases, but he was hopeful that British electrical engineers would turn their attention to this matter and evolve a conduit system which would greatly reduce the difference now existing between the cost of the conduit system and that of the overhead trolley system. It might be of interest to state that, although electricity was the youngest of the sciences, upward of $650,000,000 of capital had already been invested in Great Britain alone in electrical undertakings.

Lastly Mr. Hawksley referred to the want among manufacturers of a system of standardization—a very important point. For some time past the Council of the Institution of Civil Engineers had realized the serious difficulties and disadvantages under which British manufacturers were placed by the lack in their country of some acknowledged standards. The Council of the Institution of Civil Engineers therefore approached the Institution of Mechanical Engineers, the Institution of Naval Architects, and the Iron and Steel Institute, with a view to taking up this subject, and a strong and influential committee, representing these four institutions, was formed. The evidence laid before the committee was interesting, as showing the various methods in which the different countries carried out their work. For instance, in this country, where the American Society of Civil Engineers has issued standard sections for rails and standard specifications, the rolling-mill makers would in most cases only roll to these sections. It transpired that from time to time various inquiries had been sent to America from Great Britain for tenders for large quantities of rails and of other materials that were needed by British companies, but in nearly every case the reply was that "unless you take our standards we regret we do not see our way to quote." On the other hand, some instructive instances of the waste of time and money that occurs in Great Britain for the want of standard sections were laid before the committee. One case in point was a section incorporated in a bridge for one of the British colonies. The average cost of the material was $42 per ton, but one of the sections specified was of such an odd size and the quantity of this size was so small that the section had to be made by a blacksmith at a cost of from $140 to $150 per ton. It was, therefore, with a view to lessen the cost of and to expedite the carrying out of the works designed by engineers, as well as to enable the British manufacturers to meet the keen competition which is now threatening even the home markets, that the Institution of Civil Engineers had taken in hand this important matter.

Chicago a Great Inland Port.

That Chicago is a great shipping center almost everyone knows. But that it now ranks fourth among the ports of the world is not so well known. The latest figures relating to the matter of shipping are:

London, 16,529,095 tons; New York, 16,445,320; Hamburg, 14,198,817; Chicago, 14,186,100; Antwerp, 13,573,472; Liverpool, 11,818,000; and Marseilles, 9,629,114.

Chicago leads all United States ports except New York in tonnage, and the constant extension of lake traffic has added not only to the commerce of Chicago, but likewise very largely to the commerce of Cleveland, now a very important port of entry; Detroit, Buffalo, Milwaukee, Duluth, and Toledo.

The chief articles of commerce on the lakes are wheat, flour, coal, iron, and lumber. In 1871 the number of bushels of wheat passing through the Soo Canal was 1,376,705, while last year the number of bushels was 60,000,000, or more than forty times as much as in 1871.

Printing in Persia.

Printing from type in Persia is not regarded with popularity. This country is at the present day entirely dependent upon lithography for the native production of books and journals—which are very rare. A short time ago a press with movable types was set up, and upon which a certain number of books was printed. The effort, however, met with no encouragement, and had to be abandoned. The unpopularity of type-printing in Persia is due to two principal causes: First, the straightness of the lines offends a Persian's artistic sense, and, secondly, in printed books the character of the letters is entirely lost. The Persian reader prefers a well-written manuscript, and, failing this, he contents himself with a lithograph, which is usually the facsimile of the writing of some fairly good scribe.

© 1902 SCIENTIFIC AMERICAN, INC.

Analysis of Volcanic Dust.

BY THEODORE G. STRAUB.

In a report given out by P. Carmody, F.I.C., F.C.S., government analyst at the island of Trinidad, is a series of analyses of volcanic dust of the recent fatal eruption at Martinique which are rather interesting to note.

The first sample was collected at sea off St. Vincent by Capt. Edwards, S. S. "Louisianian;" the second at Barbadoes, and the third at St. Pierre. As will be seen the results vary considerably, though the general composition is comparatively uniform.

	S.S. Louisianian	Barbados	St. Pierre
Soluble in water—	Per Cent.	Per Cent.	Per Cent.
Chlorine	0.05	0.09	0.05
Soda	0.05	0.09 (large)	0.05 (large)
Lime	0.05 (large)	0.09 "	0.05 "
Sulphates	0.05 "	0.09 "	Trace
Total	0.45	0.45	0.30
Soluble in acids (2 hrs.)			
Iron oxid as FeO	5.60	5.01	3.59
Silica, Alumina, etc.	11 81	6.89	2.01
Lime	2.94	3.36	1.13
Magnesia	Trace	0.40	0 22
Potash		0.05	0.05
Soda		0.44	0.22
Sulphates	Trace	0.23	0.02
Phosphates	"	Trace	0.11
Total	20.35	16.38	7.35
Insoluble in acids—			
Silica and silicates	78.10	83.30	92.23
Loss on ignition	0.50	0.40	0.40
Total	99.40	100.53	100.28

From the above it will be seen that the dust can almost be called a silicate of iron and lime. All three samples show nearly the same amount soluble in water and volatile on heating, though the quantity soluble in acids varies considerably, the greatest being in the first in which there are only traces of the alkali metals and magnesia.

The specific gravity varies from 1.08 for the first to 1.28 for the third sample, the Barbadoes dust being nearly as heavy (1.23) as that which fell at St. Pierre. The latter is the coarsest of the three, 42 per cent of which were caught on a sieve 70 meshes to the inch, while for the "Louisianian" dust only 11 per cent, and for the Barbadoes only 9 per cent were caught on this mesh. In the same order 19 per cent more of the St. Pierre dust was caught on a 100-mesh sieve, 59 per cent more for the Barbadoes, and 63 per cent more for the "Louisianan" material.

In each of the three samples 3½ per cent of the dust was attracted by a magnet, which is rather remarkable. This iron that was attracted was not in the metallic state, but as an oxide.

As to appearance the "Louisianian" and Barbadoes dusts are similar, showing under the microscope light green crystals and black lustrous crystals, both probably silicates of iron. There were also present certain clear crystals. The St. Pierre dust contained reddish crystals not present in the other two.

As to the practical value of these ashes as a fertilizing agent it cannot be said to be very great, though locally their supposed value is greater than it really is. Their main advantage is that they serve to loosen and dry heavy clay soils to quite an extent. The local opinion that they are highly beneficial as a manure is due perhaps to the lime which generally has a good effect upon soils of a clayey nature. Otherwise not much can be said in their favor, since nitrogen is wholly absent and potash and phosphoric acid are present only in traces.

Franklin Webster, editor of the Insurance Press, has made a very interesting compilation of underwriting corporations that have retired from business in the United States during the last two or three decades. The summary is rather appalling, and shows how narrow is the margin of profit obtainable from the business to-day. Mr. Webster speaks thus of the exhibit: "The Insurance Press knows no better way to emphasize the magnitude of the problems confronting fire-underwriters, to demonstrate the unwisdom of legislative attacks on the insurance business, and to explode the fallacies concerning insurance 'profits,' than to ask the American people to gaze upon the list of joint-stock fire insurance corporations that have given up the struggle, and to reflect upon the causes of the failures. The object lesson is impressive. The Insurance Press has invited and received the co-operation of insurance departments in making up the record that follows, and has made use of other data, especially reports by the National Board of Fire-underwriters. During the past twenty-five years the fire loss in the United States has exceeded $2,800,000,000. This year the value of property destroyed by fire will exceed $170,000,000. Nearly 1,200 fire-insurance companies with paid-in cash capitals, mutual companies not included, have gone to the wall in the United States. Nearly all of these companies have been either burned to death or crushed out of existence by oppressive laws."

Automobile News.

The 100-mile endurance test of the Chicago Automobile Club was held over the rather poor and rough roads in the neighborhood of Chicago on the 12th inst. Of the twenty-nine starters, nine made a perfect run and were awarded blue ribbons; four averaged 99 per cent, obtaining red ribbons; one, 97 per cent; and two, 93 per cent. The best time for the course was made by Mr. F. X. Mudd, who, in a Winton touring car, covered the hundred miles in 7 hours 16 minutes. Another Winton was a close second. The average gasoline consumption was about 6 gallons, the carriage holding the record for lowest consumption being the Pierce motorette, which used 3¼ gallons. A number of the contestants were disqualified because they tried to make up time in the last controls. The arrangements were excellent and the timing was accurately accomplished. The test was one of the most successful which has been held this year.

The Kansas City, Mo., Automobile Club held a 100-mile endurance test recently over the macadamized roads in the environs of that place. Seven out of fourteen starters finished, a Haynes-Apperson machine coming in first within one minute of the 6 hour 9 minute limit. Several Pierce motorettes participated in the run, a part of which was made in a heavy rain.

The Automobile Club of America will hold a 500-mile reliability trial in October. The trial will be made over the New York-Boston route, via Springfield and Worcester, Mass. The start will be made from New York on October 9, and the arrival in Boston will occur on Saturday afternoon, October 11. Sunday will be spent in Boston and the return to New York will occupy the three days following. The run is open to all classes of automobiles of either home or foreign make. The club will supply an official observer for each machine entered.

The club is compiling a register of reliable mechanics and operators and it wishes the names of proficient chauffeurs who desire positions with club members.

Failure of the Baldwin-Ziegler Expedition.

All patriotic Americans are disappointed to learn of the failure of the Baldwin-Ziegler expedition to the North Pole. This expedition, it will be remembered, started out with a most complete equipment. Money was not spared in the purchase of the explorers' outfit, which comprised the very best of all that modern science could suggest. The cause of Mr. Baldwin's failure to reach the North Pole is ascribed to the ice which blocked all channels through Franz Josef Land, and prevented the establishment of depots by steamers last fall. The breaking up of the ice early in June compelled the use of reserve supplies, and hence it was necessary to leave Camp Ziegler on July 1. However, as Mr. Baldwin puts it, he has been "baffled, but not beaten," from which we are led to expect that a second attempt will be made next year, which it is hoped will meet with better success. The chances are very favorable for another "dash to the pole" because of the enormous depots of condensed food which were established by means of sledges at important localities this year.

American Agricultural Implements Wanted in India.

The United States Department of Agriculture has received a request from India for information in relation to American agricultural implements. The writer desires catalogues giving descriptions of reapers, corn binders, plows, and other agricultural implements, together with the cost of transportation to that country. He also asks if there is to be found a plowing machine worked with wheels, of simple construction and moderate price, which will turn up land 2½ or 3 inches deep and can be operated by one man or steam power.

The writer is willing to act as agent for the introduction of such implements. Manufacturers and dealers who may be interested in the matter should address Charu Caundra Basu, P. O. Mehurpur, District Nadia, Bengal, India.

The Current Supplement.

The current SUPPLEMENT opens with a handsomely illustrated article on the warships at Spithead for the Coronation Naval Review. It contains also a very complete and copiously illustrated article on wireless telegraphy and submarine cables. A subject of much interest deals with the forests of the Philippine Islands, which shows the great extent of the timber lands and the varieties of wood there found. The Development of Electro-Chemistry is fully treated in a comprehensive article by Mr. R. H. Johnston. Our readers will be interested in the paper by Mr. Graham Bott on Perfumes; Their Antiquity and Uses, with Formulæ. Meter-Gage Fairlie Engines for the Burma Railway Company is the title of an article which will prove of great interest to all connected with railroad affairs. The usual Trade Notes and Recipes are given together with Trade Suggestions from United States Consuls.

Science Notes.

A novel type of vessel has been inaugurated by Capt. W. M. Walters, of Liverpool, for reporting purposes in connection with the English mercantile marine. The first vessel is to be fitted with the Marconi wireless telegraphy system, and is to be moored near the Jones Bank, 66 miles west by south of the Bishop Rock, Scilly, to report between the ship and the mainland. The commercial value of the plan is that it will obviate the necessity and expense of a ship putting in at ports "calling for orders."

The British Admiralty have decided to build their destroyers much stronger in the future than those already in existence owing to their frequent breakdowns, due, according to the findings of the naval experts, to the general frailty of construction. Stability and strength have been sacrificed to too great an extent in order to obtain high speed. This latter desideratum has therefore greatly militated against the success of this type of boat, since recent events and prolonged inquiries have shown that it cannot withstand the heavy baffelings of the waves encountered in a rough sea. Strengthening of these boats will, however, result in a reduction of speed, so they will not be efficient for one particular purpose for which they are required—scouting. To supply this deficiency, however, the Admiralty are introducing a new type of warship described as the "Scout" class, and from this appellation the function for which it is intended may be realized. These new vessels are to be much longer and stronger than any destroyers hitherto built, and will be able to remain longer at sea than either torpedo boats or torpedo destroyers. They are to have a speed of 30 knots an hour. Four vessels for experimental purposes are to be laid down at once, for the construction of which $147,175 has been allotted. The Admiralty do not intend to initiate the design of this type of boat, but the various private shipbuilders are to draw up plans, coinciding with the special requirements of the navy, so that the Admiralty may have the choice of a selection.

M. Henri Moissan has been making experiments with silicide of calcium in order to determine its properties and especially to find out whether it possesses any analogy with carbide of calcium in the formation of compounds like acetylene. Although the silicide of calcium has already been prepared in a more or less pure state its properties have been but little known. M. Moissan prepares it by heating in the electric furnace a mixture of calcium oxide and pure silicon. The mixture is heated in a carbon tube closed at one end, using a current of 600 amperes at 60 volts. The melted mass is not homogeneous, but is surrounded by an external layer of carbide of calcium and below are striæ of crystallized silicate of lime, while in the center is a brilliant mass of silicide of calcium, mixed with varying quantities of silicon. The reaction is thus represented: $2\,Ca\,O + 5\,Si = 2\,Ca\,Si_2 + 2\,Si\,O_2$. The silicide is then separated by an appropriate treatment; it is easily characterized under the microscope by the formation of yellow crystals of silicon on contact with weak hydrochloric acid. As to its physical properties, the mass of silicide may be pulverized in an agate mortar. It has a metallic appearance, and is made up of crystals of undetermined form. The crystals are of a grayish color and very brilliant. The density of this body is 2.5. It is insoluble in alcohol, ether, benzine or ammonia. It presents some chemical reactions of interest; it does not combine with hydrogen at redness, but takes fire when cold in fluorine gas, giving off fluoride of silicon and forming a fluoride of calcium which is partly melted by the heat. Chlorine does not attack it cold, but when heated in a current of the gas it becomes rapidly incandescent and produces chloride of calcium and silicon chloride. When heated in air or oxygen it is but slightly attacked, but under the oxyhydrogen blowpipe it burns with incandescence, forming lime and silica. When the silicide is heated in the electric furnace for 10 minutes in the presence of carbon, using a current of 800 amperes at 60 volts, it is completely transformed into carbide of calcium and silicide of carbon. Melted copper dissolves it but slightly, while, on the contrary, aluminium dissolves it readily but also decomposes it, forming silicide of aluminium. The latter body, when acted upon by hydrochloric acid, gives off hydrogen silicide gas which is spontaneously inflammable. Cast iron in fusion decomposes this body into silicide of iron and carborundum. The action of water upon the silicide has been especially observed, owing to its analogy with carbide of calcium. When reduced to powder and placed in water the decomposition is very slow and even requires several months. In this case it gives off hydrogen and does not form any products resembling acetylene. The acids act upon this substance to a greater or less degree; one of the most striking reactions is that of hydrofluoric acid upon its powder. In this case it becomes incandescent, giving off fumes of silicon fluoride and producing silicon of a yellow color.

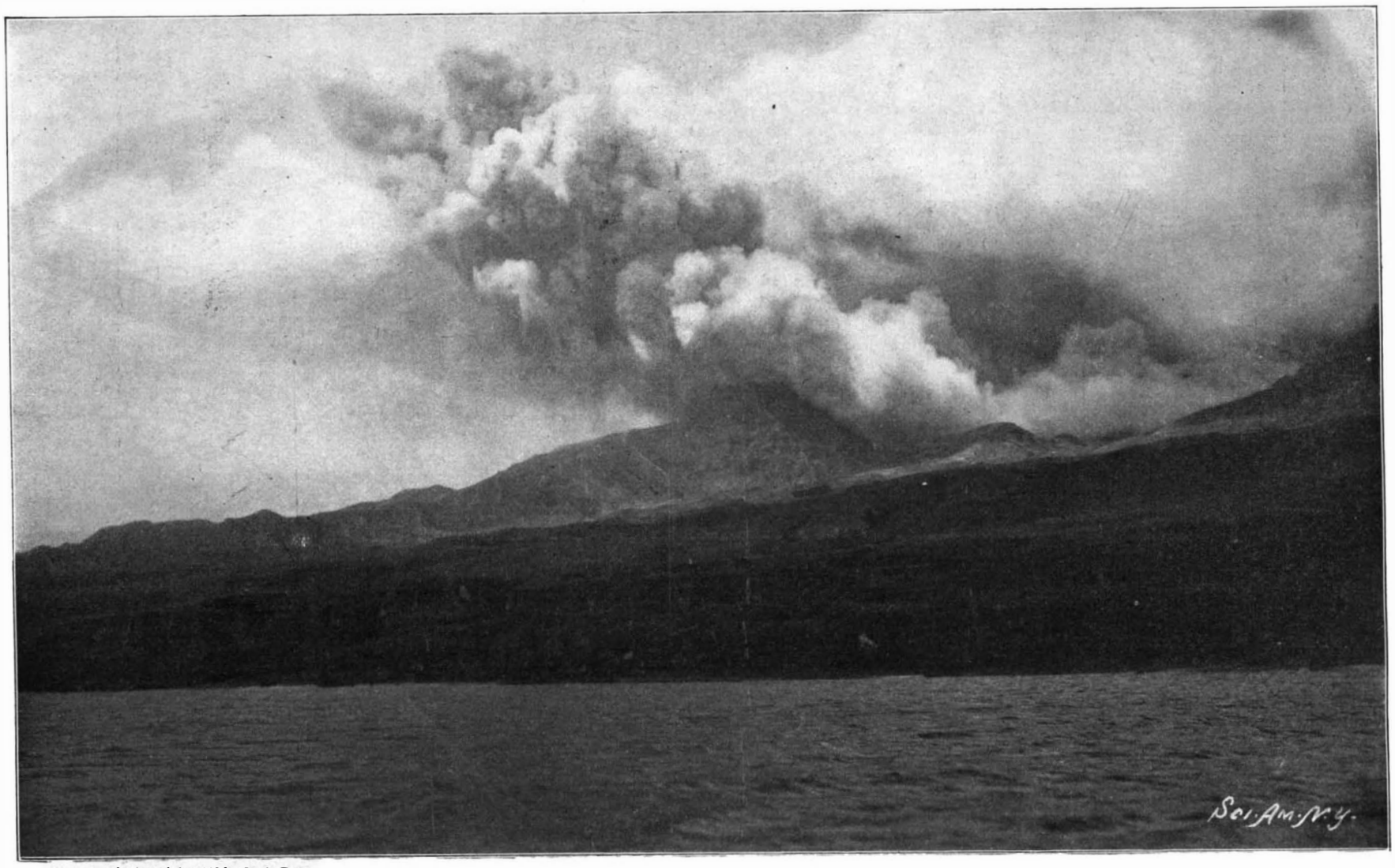
© 1902 SCIENTIFIC AMERICAN, INC.

MONT PELÉE IN ERUPTION.

BY E. C. ROST, SPECIAL CORRESPONDENT.

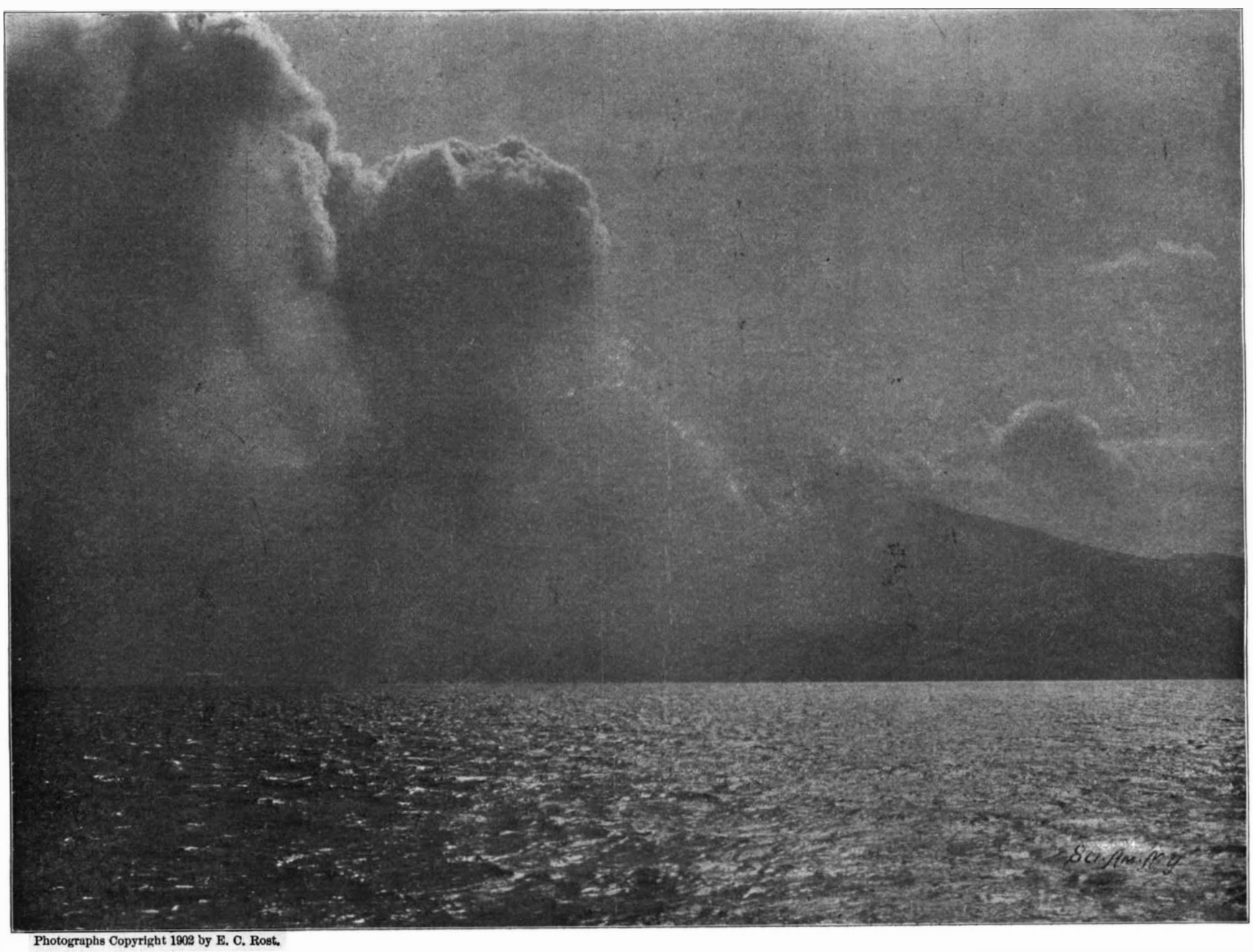
It is not my intention to review the events that occurred on Martinique just before the fatal 8th of May and up to the final destruction of the town, but to give a brief account of my observations during some of the eruptions of Mt. Pelée and my ascents of the volcano, in connection with the American and English Scientific Commissions.

St. Pierre, perhaps the most beautiful of all West Indian cities, with its pretty houses nestled at the foot of the verdure-covered cliffs, with the brilliant coloring of the town reflected in the perfect blue of the Caribbean waters, and the mass of picturesque shipping anchored in the roadstead, exists only in mem-



Photograph Copyright 1902 by E. C. Rost.

SECOND STAGE OF THE ERUPTION (30 SECONDS LATER) SHOWING THE CLOUD OF VAPOR SPREADING AND DESCENDING ALONG THE SLOPE OF THE MOUNTAIN.



Photographs Copyright 1902 by E. C. Rost.

THIRD STAGE OF THE ERUPTION (1 MINUTE LATER) SHOWING VAST AREA COVERED BY THE CLOUD—THE SAIL OF THE SLOOP FROM WHICH THIS PHOTOGRAPH WAS TAKEN WAS DESTROYED THIRTY SECONDS AFTER THE PLATE WAS EXPOSED IN THE CAMERA.

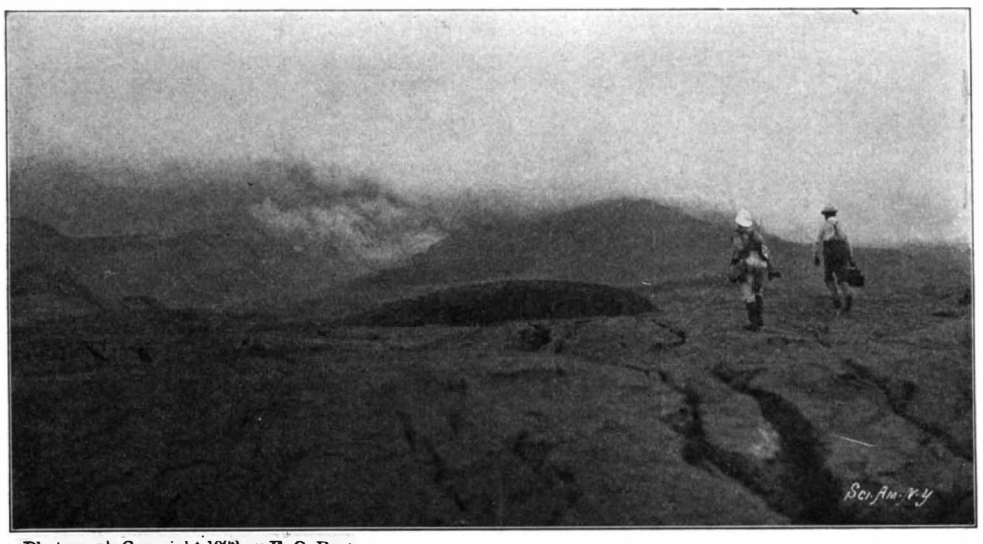
© 1902 SCIENTIFIC AMERICAN, INC.

ory. It would take the pen of a Danté to do justice to the scene. St. Pierre, only a few weeks since a city full of human souls, is no more. It lies consumed before us, silent and desolate, a city of the dead.

No words can convey the vastness, the completeness, of the destructive powers that have wrought this weird transformation. A party of three of us decide to explore the volcano, on the leeward side from St. Pierre, moving up over the track of the forces which came from Pelée's crater on their awful errand of destruction. We take every precaution we can; our boat manned by five natives, is to lie off shore, ready to pick us up at any hour. We decide, however, to visit St. Pierre first. Here we find that the sea front shows no material change. Many buoys are still there, the sea wall of heavy masonry shows the same old water marks, coral and sea moss. We next travel through what once were streets, but are now masses of broken stones, iron work, wood, and dead bodies, all covered by the prevailing lead-colored dust. It was with great difficulty that we wended our way up through the ruins, because of the great depth of the dust. Then we crossed the deep mud flats, occasionally stepping into a decomposed body. We succeeded in reaching the bluff above that section of the town known as the Fort. The other two sections were called Centre Mouillage, from which point we have an extended view of Mt. Pelée, or rather what was at one time Mt. Pelée, but is now a mass of torn and broken rocks, mud-lava, ruins of houses and plantations, with ravines and hills of débris; yet withal, the general outline of Pelée is as of old.

At our feet (some 300 feet below) still flows the Riviere Roxelane, which is spanned by two bridges, one of stone, the other or iron and steel—on the latter heavy steel plates were all bent away from the mountain side. Just beyond the river we see cropping out here and there on the various terraces, parts of buildings; for this section of the city was buried under a tremendous mud-lava flow which in one section measured quite 200 feet in depth. This bed of volcanic matter, mud-lava, pumice-stone and dust, completely covers the leeward slopes of Pelée, filling up deep ravines and valleys, and as we view the volcano from St. Pierre, it seems an easy and gradual ascent to the very summit. We decide, however, to make the ascent up the valley of the Riviere Blanche, down which swept the death-dealing blast from the crater.

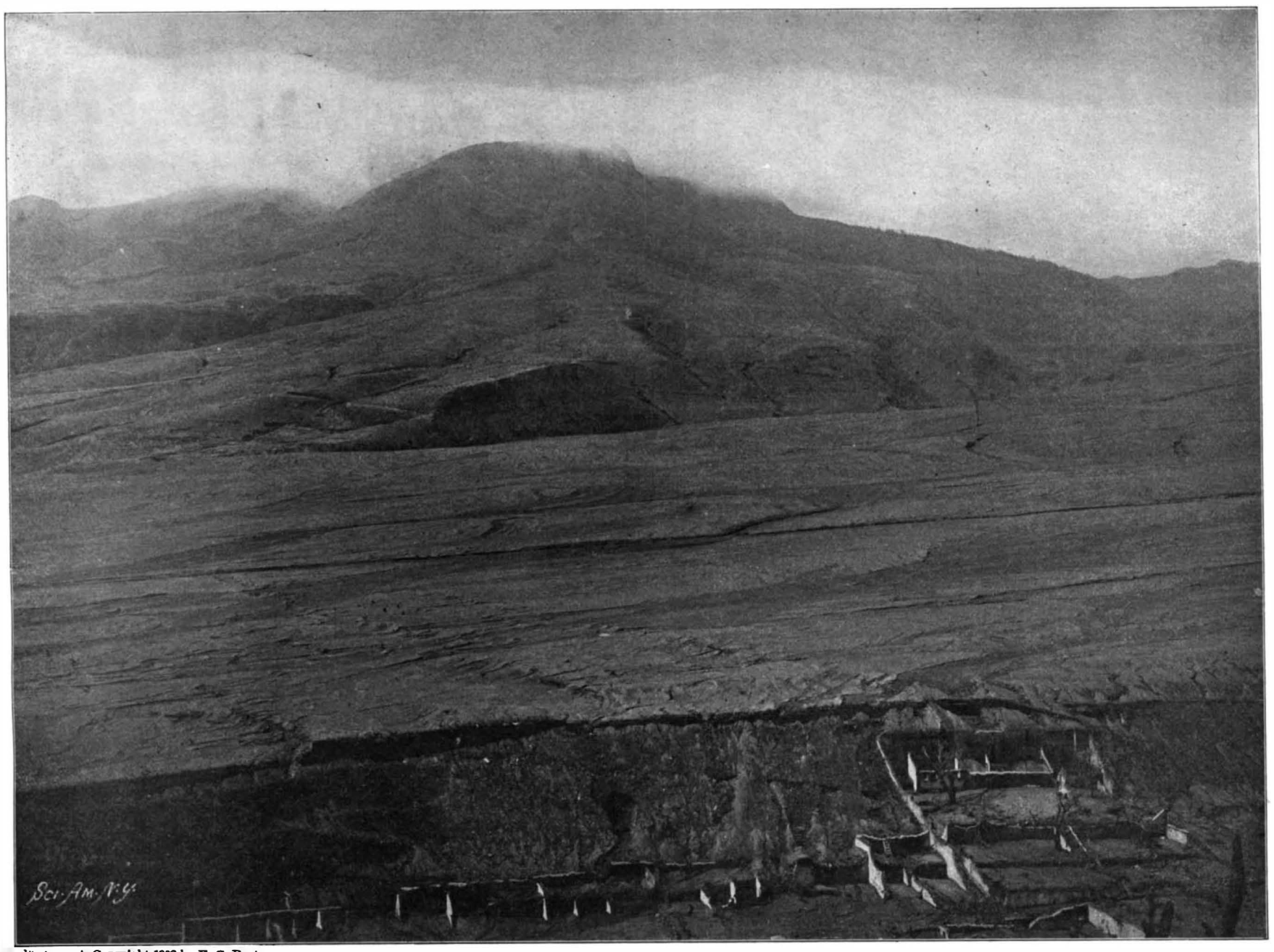
Having spent the night at Carbet, enjoying the hospitality of Charles Gouyet, the administrator of the northern section, we start at the low-vitality hour of 4 A. M., our boat taking us to the mouth of the Riviere Blanche, and travel up the at first gradual slopes, and over hot, red-hot, beds of ashes, over which a cool crust has formed of sufficient strength to bear our weight. Now we find beds of pumice, then again soft mud; but generally we travel through dry dust, all of a dull leaden color, save that here and there the red ashes still show through. Occasionally we are treated to a supposed eruption. By that I mean an entirely superficial eruption. These are caused by the deposits of red-hot dust, sliding as does a land slide, into the river, when vast clouds of vapor and dust ascend at times not only up to, but actually through and above the clouds. These superficial eruptions occur sometimes only fifteen minutes apart, then, again, we have but one or two a day.



Photograph Copyright 1902 by E. C. Rost.

CRATER OF MONT PELEE JULY 4. THE FIGURE AT THE LEFT IS DR. T. A. JAGGAR, JR., OF THE U. S. GEOLOGICAL SURVEY.

By 7 A. M. the aneroid shows us to be 2,500 feet above sea-level, and about opposite the crater, out of which come the real eruptions. Practically at the crater's edge we find old sugar-cane fields, where are seen the charred remains of cane, which have been covered with great deposits of dust, but which are now furrowed by the heavy rains, which have left the deposits in queer, fantastic shapes. Then again we cross great high ridges of mud-lava. Just ahead of us is revealed the huge cup-shaped cone or crater proper, but our view of this is but for a moment at a time, for it is now the rainy season, and clouds continually hover over and cover the mountain; moreover, steam and vapor rising out of the crater prevent a good view. In a northeasterly direction and looming far above us we see the huge Shark's Fin," a tremendous cliff, left standing when the very top of Pelée was blown away. The summit is now 4,140 feet, and was formerly 4,290 feet high, being lowered by but 150 feet. These figures do not give a true idea of the great fissure in Pelée's sides, which runs toward the west from the crater. Along this fissure have been thrown great angular blocks, and huge rents have been torn into the sides of the slopes, out of which come puffs of dust-laden steam. All is in a turmoil and seems to be moving not down the mountain sides, but in every direction. The old Lac des Palmistes, a lake near the summit on the easterly side, supposed to be the old crater of fifty-two years ago, is now dry and covered with angular blocks of stone, vomited by Pelée. From this point there is an easy descent down the eastern slopes to Basse Pointe and Morne Rouge, but we prefer to descend again along the Riviere Blanche valley, as in this direction came mostly all of Pelée's destructive forces. Save for our hearing some severe rumbling within the crater, resembling the rushing of steam and the sound of boiling water, the



Photograph Copyright 1902 by E. C. Rost.

NORTHERN PORTION OF ST. PIERRE COVERED BY A MUD FLOW WHICH AVERAGES 200 FEET IN DEPTH. IN SOME PORTIONS OF THE VALLEY ABOVE, THE DEPTH OF DEPOSIT WAS 600 FEET.

© 1902 SCIENTIFIC AMERICAN, INC.

descent was uneventful, unless I may add that the temperature as we rested for a few moments proved to be quite cool, so cool in fact that coats were longed for. This was at an altitude of 2,000 feet, half-way up the volcano.

On reaching the shores near our starting point we find our boat in waiting, with the native crew most anxious to leave, and we ourselves possessed of a pleasurable feeling that we were again in a comparatively safe place. Safe only by comparison with other places within the range of Pelée's activity (a circle of 10 miles in diameter); for while off this very point in our frail craft a few days later we were so fortunate as not only to see one of Pelée's most important eruptions, that of July 9, but to escape unhurt. We had just returned from another exploring expedition of the lower slopes, and of St. Pierre, when the rumbling and hissing seemed louder than usual. The cauliflower clouds, so peculiar to and characteristic of Pelée, suddenly became darker in color, and above all arose the much dreaded "black smoke," which seemed to pour over the sides of the volcano, then form itself into a great, huge mass which rolled with a circular motion down Pelée's slope toward St. Pierre, spreading itself out more and more, and coming for miles out over the Caribbean Sea, enveloping everything in darkness, covering all with the gray dust, ashes and pumice stone. Our crew seemed to think it necessary to spend their time on their knees and pray, and we were thus forced to use the oars to the utmost of our strength to bring our craft farther on down toward Carbet, for we knew that the bluff south of St. Pierre has thus far warded off the deadly blast, thus leaving a place of refuge, perhaps one-half mile off shore. This eruption lasted from 6 P. M. until 10:30 P. M. Having witnessed this and other eruptions of Pelée I am inclined to believe that the destructive forces consisted of superheated steam, hot pumice and a blast of tornadic force, which swept everything before it. Add to this the electric disturbances, which at times were so vivid as to quite resemble shooting flames, and the peculiar feature that the electric disturbances were much more noticeable at the water level.

I am satisfied that St. Pierre and its people were slain by superheated steam, laden down with an almost incalculable weight of red-hot sand, stone and pumice and traveling with a circular motion, at hurricane speed. After this blast had passed over St. Pierre it carried the heroic-sized statue of the Virgin, which stood on a bluff to the south, fifty-two feet from its base, and then overturned and tore from their carriages huge modern cannon, which stood in the fort still farther to the south. Daylight next morning revealed a scene of utter destruction. In every direction from Pelée's crater great rivers of hot sand and mud were tearing and roaring down its sides, while steam was issuing from every crevice. St. Pierre was again covered with ashes, and the foliage between St. Pierre and Fort de France was covered with a gray mantle.

To witness such an eruption is an experience never to be forgotten. I would not have missed it for much in this world. As to the future, no man, scientist, or layman, can predict just what Pelée will do. "Stay away at least for a time" is the only safe advice.

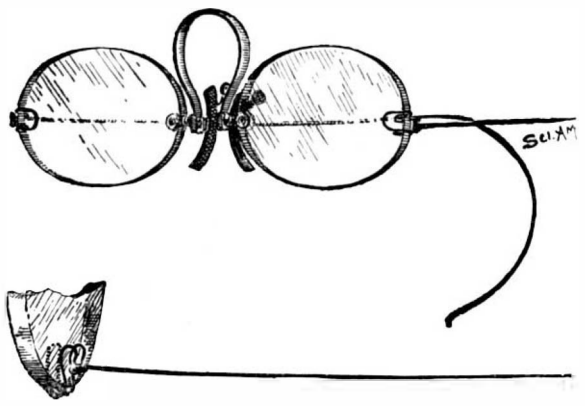
Much has been done by scientific men, much has been learned as a result of Pelée's later eruptions. But much more remains unanswered.

Now just a few words more as to my own observations. One of Pelée's big eruptions at night, as witnessed at a distance of eleven miles, was quite as awe-inspiring, even more weird and uncanny than the eruptions I witnessed at close range. The skies in the direction of Pelée become impenetrably inky black. This black mass moves upward and toward you. Suddenly all over this black space appear myriads of lights, just like incandescent electric lights; now they glow, now all is dark. There is no perceptible motion to these lights. But suddenly they all move in one direction, then in another. Now up, now down; now east, now west. Then just as you think you have discovered their line of motion they suddenly dart in every conceivable direction. You see everywhere: now sharp, zigzag flashes, now circular, like myriads of monster pin wheels; now all have a spiral motion, then of a sudden all is dark again, and you think the worst is over. But no, they appear again; are much more active and much nearer; the blackness now extends from the horizon in the north quite over your head; in a few minutes more it has spread out like a huge umbrella, quite to the southern horizon, completely shutting out all sky. But lo, and behold, of a sudden the scintillating lights and flashes appear again, and under that black pall, now so completely surrounding us, are seen all of nature's clouds that before the eruption were visible by moonlight, placidly floating by and all brilliantly illuminated by the electric display far above. In a short time dust falls upon us, and then stones, the size of walnuts. It was a majestic scene that will live as long as memory endures.

Patent Department

SOME RECENTLY PATENTED NOVELTIES.

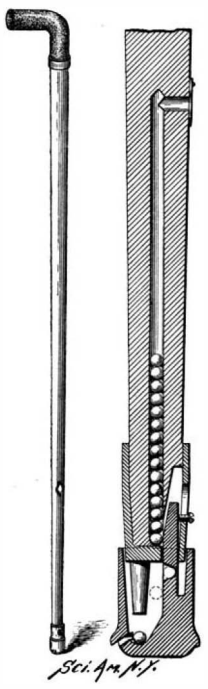
TEMPLE ATTACHMENTS FOR EYEGLASSES.—Spectacles, though not so stylish and neat in appearance as eyeglasses, are nevertheless greatly used because they can be so much more securely held in place. Occasionally a man carries a pair of each style,



TEMPLE ATTACHMENT FOR EYEGLASSES.

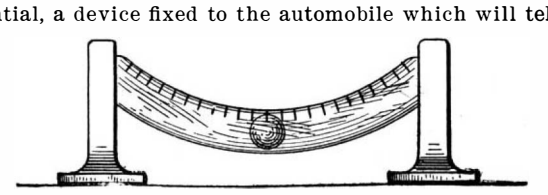
using the spectacles only whenever his duties or pleasures do not permit of the convenient use of eyeglasses. This, however, is a great annoyance, and is quite expensive where high-priced lenses are worn. Our illustration shows a much cheaper method of adapting one's eyeglasses to varied requirements. A pair of temple pieces are provided which are adapted to be clamped to the lenses of the eyeglasses, thus converting them into spectacles. These attachments are very simple, and can be cheaply made, so that if lost they can be replaced at but slight expense. By their use the glasses will be firmly held, no matter how violent the exercise or how warm the weather. A patent for this attachment has recently been granted to Mr. E. L. Lembke, of New York city.

MAGAZINE TORPEDO-CANE.—A simple amusement for children is provided by the invention of Mr. John H. Fox, of Fostoria, Ohio. The device comprises a cane having a hollow bore which forms a magazine for storing a number of torpedoes. On the end of this cane is a selector for feeding a single torpedo at a time from the magazine, and a detonator for exploding the torpedoes as they are fed out. The detonator consists of a pin formed on the bottom of a sleeve ferrule which is fastened to the end of the cane and closes the lower end of the magazine. A mortar embraces this ferrule and allows it a limited vertical motion therein. The mortar is provided with an arm which passes up into the bottom of the cane and forms a wall for the lower end of the torpedo magazine. In this arm is a recess so located that the lowest torpedo in the magazine will be forced by gravity therein when the cane is in its lowest position. As the cane is raised, the mortar remains stationary and the torpedo rests in the recess until the lower end of the ferrule has been cleared, when it drops by gravity into the firing chamber. On the next downward stroke of the cane, the detonator pin explodes this torpedo and at the same time the next lowest torpedo in the magazine drops into the recess of the selector arm; thus the torpedoes may be rapidly and successively delivered to the firing chamber and exploded.



MAGAZINE TORPEDO-CANE.

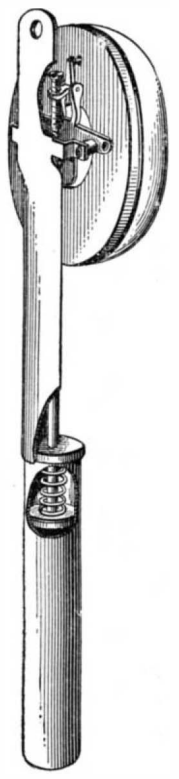
IMPROVED GRADOMETER.—While not absolutely essential, a device fixed to the automobile which will tell



AN AUTOMOBILE GRADOMETER.

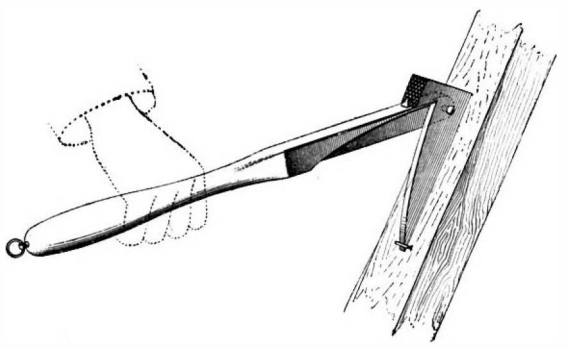
at a glance the per cent of a grade being climbed is a great source of satisfaction. There are a number of gradometers on the market, but most of them are built on the lines of the spirit level, and the little bubble is so sensitive to every movement of the vehicle and its movements so convulsive that it can hardly be seen as the carriage moves along. In order to meet the shortcomings of the others an improvement has been designed by J. H. Bullard, of Springfield, Mass. It consists of a curved glass tube fixed rigidly in a frame, which is to be fastened to some convenient surface of the vehicle. The lowest part of the tube is in the center, and before the tube is sealed a metal ball, having a diameter nearly that of the inside of the tube, is placed therein and the tube is then filled with some non-freezing liquid such as alcohol. The ball will, of course, seek the lowest point, and in doing so will register the grade of the hill being negotiated. While the action of the ball in finding the lowest point is not at all tardy, the resisting action of the liquid which it must displace as it moves about prevents it from being wildly agitated back and forth.

THERMOSTATIC FIRE-ALARM.—In a recent number of the SCIENTIFIC AMERICAN we described a thermostatic fire-alarm, in which the gong was rung by electricity. The inventor, H. C. Vierkaut, of Tarrytown, N. Y., has invented another thermostatic fire-alarm which is entirely mechanical in its operation. The alarm consists of a base, on which is mounted a spring-actuated train of gearing, the winding shaft of which is threaded to receive the gong. The bell clapper is vibrated by an escape wheel suitably connected with the gearing. When the temperature in the room rises to the danger point, the liquid in the thermostat expands and lifts a plunger which, through the medium of a bell-crank lever, forces in a pin at the back of the alarm base. This releases the clapper and permits the alarm to sound. The end of the plunger stem is connected with the bell-crank lever through a set-screw. By adjusting this screw the alarm can be made to sound at any desired temperature.



THERMOSTATIC FIRE-ALARM.

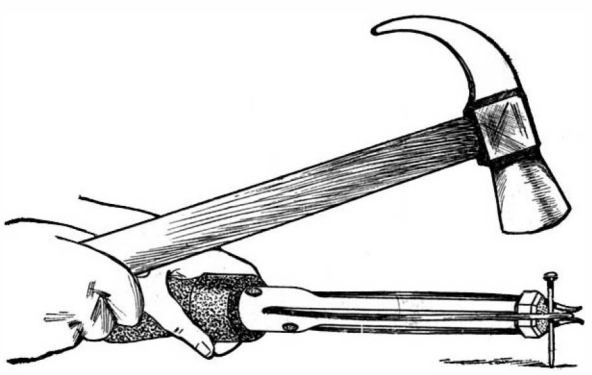
STAPLE EXTRACTOR AND HAMMER.—A United States patent has been recently issued for a combined staple extractor and hammer, which comprises a handle having a side portion cut away at one end and edge and having a rounded extremity. A member is pivoted to the handle concentric to the round end and having its long arm combined and arranged to fit snugly in the cutaway portion of the handle. A head at the outer or



STAPLE EXTRACTOR AND HAMMER.

projecting end of the opening may overlap the rounded end of the handle and project beyond its inner or lower edge. The projecting portion forms a hammer, and is notched to provide a claw to overlap the inner edge of the hammer and limit the opening of the pivoted member.

NAIL-HOLDING IMPLEMENT.—A man who has evidently experienced the difficulties of tacking down a carpet or hammering small brads and nails in inconvenient places has invented a simple hand implement adapted to hold the nail until it has been properly started. The construction of this instrument, which will be readily comprehended by a glance at the illustration, is of the simplest order, comprising a number of spring fingers secured at their inner ends to a body portion and held in alignment near their outer ends in



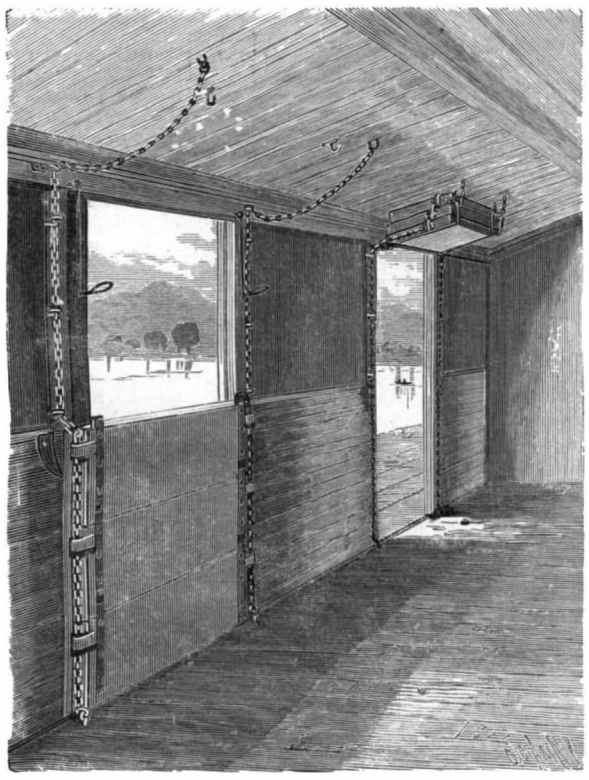
A HANDY NAIL-HOLDING IMPLEMENT.

© 1902 SCIENTIFIC AMERICAN, INC.

the channels of a headpiece. The spring-fingers are adapted to hold the nail firmly against the end of this channeled head. The extremities of the spring-fingers are so formed as to readily receive the nail and permit of the withdrawal of the instrument after the nail has been partly driven. A patent for this device has been recently granted to Mr. Frank Boelk, of Walton, Minn.

IMPROVED GRAIN DOOR.

It is found necessary in railroad transportation of grain that the freight cars be provided with an inner or auxiliary door to form an extra tight closure and



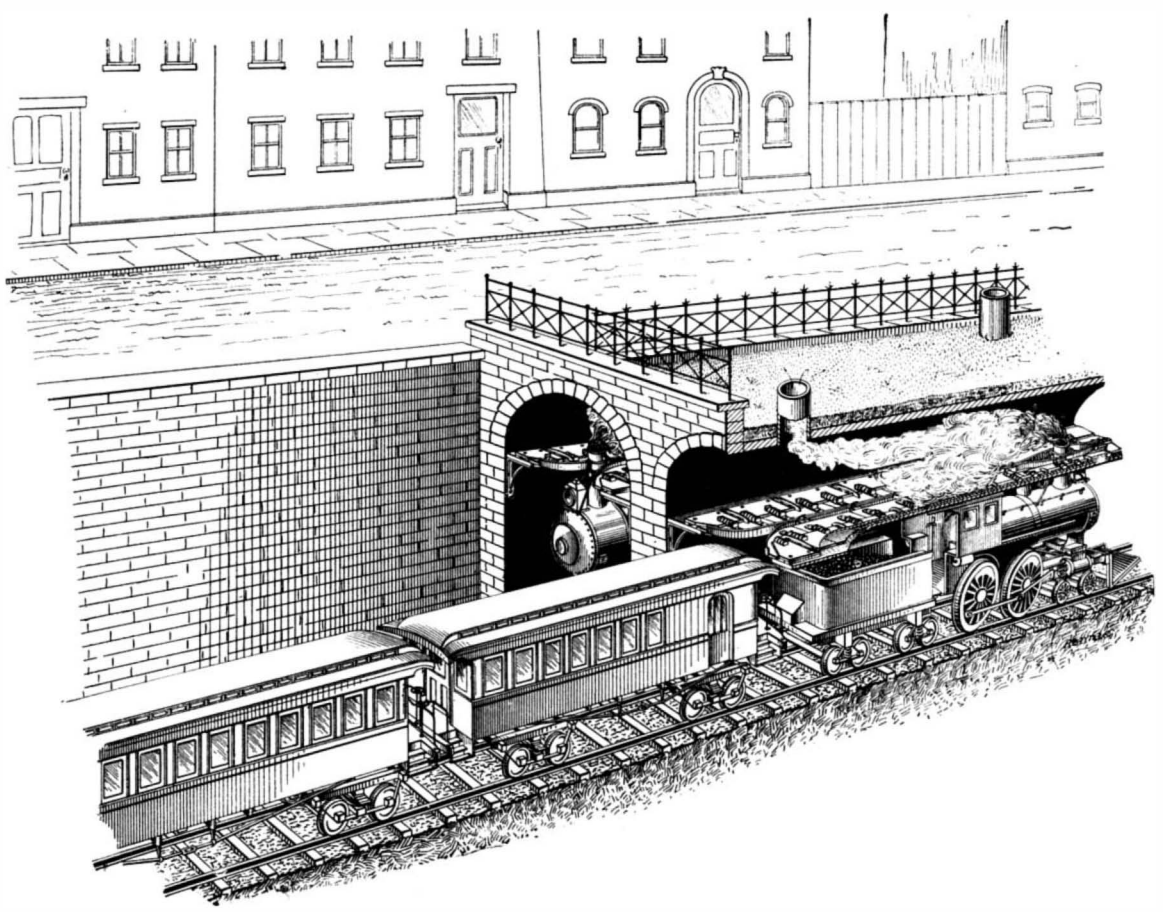
IMPROVED GRAIN DOOR.

prevent leakage of the grain. A door of this sort is provided by the recent invention of Mr. Alva T. Stark, of Geneva, N. Y. This door is composed of several sections or panels, which may be secured collectively or separately in a great variety of positions, or if desired, they may be folded up under the roof of the car, thus offering no obstruction to the door opening. Our illustration shows one of these doors in the lowest closed position and the other folded up and out of the way. The panels, which are preferably made of wood, are provided with vertical grooves at each end in which lock-plates are fitted. These lock-plates project above their respective panels, so that the upper ends of one pair of lock-plates will engage the lower ends of the grooves of the panel just above. Thus a tight connection is afforded and the grain is effectively retained. At each side of the car door is a chain, which is fastened at one end to an eye-bolt in the floor and at the other to the ceiling. The chains are provided at regular intervals with eyes which are adapted to engage hooks at each side of the door. The lock-plates on the panels are provided with guides, which loosely receive the chains and are thus held against the door posts. In order to hold the panels in the closed position indicated, it is merely necessary to draw the chains tightly and hook them onto the first hook above the highest panel, thus firmly locking the door in place. When loading or unloading the car, if it be desired to decrease the height of the door, this may be readily done. The uppermost panel is raised to the required height and locked in this position by the chains, which are hooked on the proper hooks above and below the lock-plates. When desired the next panel can be similarly raised and held, or all three of the panels may be lifted from the floor so as to facilitate the discharging of the cargo into chutes or hoppers. Pivotally fastened to the framing of the car at the top of the doorway are two arms which terminate in laterally bent eyes. These arms serve to hold the sections of the grain door in their folded position against the roof of the car, as shown at the rear in our illustration. It will be observed that when thus folded the panels all lie above the door opening and the door offers no incumbrance to the loading and unloading of the car.

SYSTEM FOR VENTILATING TUNNELS.

The main objection to crowded steam railway tunnels—an objection which was strongly emphasized by a recent disaster in New York city—is the lack of proper ventilation. Steam and smoke obscure the danger signals, thus endangering the lives on the train, and the air is vitiated by the cinders and gases so that all windows and doors must be closed—obviously a great annoyance to passengers in summer weather. Mr. John Kress, a citizen of New Rochelle, N. Y., who has daily experienced these annoying conditions, has suggested a novel method of avoiding this smoke nuisance. Since all the objectionable gases come from the smokestack, he proposes to provide a separate tunnel for the smokestack to discharge into, thus leaving the air in the main tunnel pure and uncontaminated. To this end Mr. Kress has invented the arrangement shown in our illustration. The tunnel is divided longitudinally into an upper and lower portion by a horizontal partition. This partition, which is placed at a sufficient height to clear the top of the cars, is made of two sections, which are supported by brackets on the side walls of the tunnel. Each section comprises two stationary plates, between which a series of spring-cushioned slide plates are adapted to slide. these slide-plates are provided with contact flange sections, which are interlocked with each other, so as to permit a slight play whereby an individual flange may be sprung out of its normal position without interfering with the positions of the adjacent flanges. The contact flanges of each section meet along the center line of the partition except at the ends of the tunnel, where, together with the slide-plates, they are rounded off to facilitate the entrance of the smokestack of the locomotive. The smokestack of the locomotive is provided with an extension piece fastened thereto and securely braced, which is adapted to pass in between the contact flanges. Friction bands on this extension piece serve to take up all wear from the friction of the flanges. As the smokestack passes along the flanges, the sections yield successively before the advance of the stack, but close up immediately after the transit of the same. Thus only a small elongated opening is left between the two divisions of the panel and all the smoke is confined to the upper division, whence it is drawn off by suitable ventilators, as shown, while the cinders which collect on the guide plates can be swept off from time to time into chutes at the sides of the tunnel. The air in the lower portion of the tunnel, therefore, remains pure, and there is no necessity of closing doors and windows of the cars in hot, stifling weather.

N. W. Gales, of Waterloo, Iowa, has perfected an improved disk for use in cream separators which greatly increases the efficiency of the machine. The disk instead of being plain is corrugated, and this is the essential part of the improvement. He has recently sold the right to manufacture this disk to the Clinton Separator and Engine Company for the sum of $83,000.

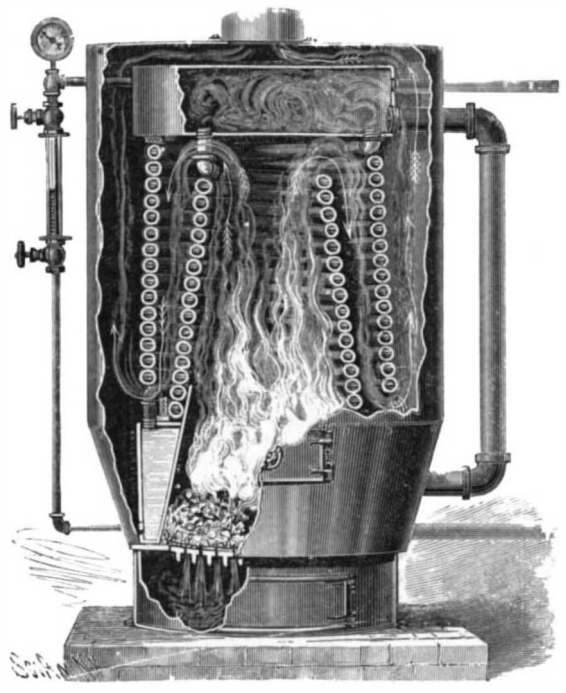


SYSTEM FOR VENTILATING TUNNELS.

HEATER AND BOILER.

An improved form of hot-water heater, which may be readily converted into a steam boiler, has recently been invented by Mr. Nathaniel B. Wales, of Braintree, Mass. The heater combines a great heating surface, a complete utilization of the products of combustion, and a simplicity of construction which obviates all danger of leakage.

The peculiar construction is clearly illustrated in the engraving, which shows the main casing partly broken away to expose the interior details. It will be noticed that the firebox is surrounded by a water chamber from which two frusto-conical coils of tubing extend upward. These tubes connect the water chamber with an upper chamber at the top of the heater. The



HEATER AND BOILER.

several turns of tubing in each coil are laid in close contact with each other, so as to form walls for guiding the passage of the hot gases from the firebox. As indicated by the arrows, the gases are forced to pass through the top of the inner coil, over the same, and down between the two coils, whence they pass out under the outer coil into the main casing of the boiler and up through the chimney. Thus it will be seen that the heat of the gases is utilized to the greatest possible extent. The inclined walls of the firebox and the coils afford a much more effective heating surface than if these walls were perpendicular. A feed, blow-off and water-return pipe enters the water chamber near the bottom, while a water-circulating pipe provides an outlet for the upper chamber.

Such is the arrangement when the invention is used as a heater, but the same construction may be used as an ordinary steam boiler by simply adding the usual steam and water gages, the pressure gage and a circulation pipe connecting the water chamber with the upper chamber. The upper chamber now serves as a steam drum, and the water level would be between the upper turn of the inner coil and this drum. The water-circulating pipe now serves as a supply pipe for the steam. All connections between the coil tubes and the iron castings are made with brass unions, so that the parts may be readily taken apart when desired, and there are no joints to spring and cause leaks.

At Westfield, Chautauqua county, N. Y., the remains of a great mastodon were unearthed. Various bones among which are the following, were found: Shoulder blade, with socket for articulation of foreleg; hip bone; section of spinal column containing four vertebræ; sections of both extremities of spinal column; knee cap, nine ribs and some other bones. The ribs are 4 feet 3 inches long and 4 inches wide. Two mastodon skeletons have been previously found in this county, one at Sheridan and one at Jamestown, but both in an advanced stage of decay.

© 1902 SCIENTIFIC AMERICAN, INC.

RECENTLY PATENTED INVENTIONS.

Agricultural Improvements.

MANURE-DISTRIBUTER. — J. HOWELL, Schaller, Iowa. In the construction of this improved fertilizing distributer, it has been Mr. Howell's aim to provide means for breaking up clods and distributing the latter in a fine spread-out condition, to provide for positively moving the slatted bottom in either direction by the power of the moving vehicle, and to provide means for throwing the working parts out of gear in transporting the apparatus from one place to another.

FEED-TROUGH.—J. W. BARNES, Beaverton, Oregon. The feed-trough is designed more especially for feeding hogs. It is arranged to promote cleanliness and secure better sanitation by protecting the food from being soiled by the dirt of the hogs' feet. It is also so arranged as to enable small hogs to feed equally without being displaced by the large ones, and to protect the clothing of the person feeding from being soiled by the splashing and crowding of the animals.

Engineering Improvements.

SPARK ARRESTING AND DISCHARGING DEVISE.—E. J. SMITH, High Springs, Fla. Mr. Smith has invented an improvement in spark-arresters and dischargers for use on coal or wood-burning locomotive engines. A spark-arresting wire screen or cage is located in the smoke box over the lower end of the stack-saddle and is provided at its upper end with a cylindrical cap having numerous slots for permitting an unobstructed draft. Means are provided for lifting the screen whenever the engine is working and the blower is applied, thus sliding the slotted cap into engagement with a flange which closes the slots and prevents sparks from passing therethrough.

PADDLE-WHEEL.—J. J. GRAHAM, Imperial, Penn. This paddle-wheel is adapted for use on steamboats, and it comprises certain novel constructions and combinations of parts whereby it may be set automatically to proper angle to operate in the water and to rise out of the water without lifting the same whether the wheel be revolved in one direction or the other.

MOTOR.—R. L. BARNHART, Charleroi, Pa. The invention relates to an internal combustion or explosive motor, the main feature of which lies in the provision of a receiver in which the charge is exploded, and which serves to carry a continual pressure of gas, this pressure being communicated from the receiver to the motor, which is thereby driven.

Hardware and Tools.

PROFILE-TOOL FOR MAKING PIPE-MOLDS.—FRANZ BURGERS, Bulmke, Germany. The tool is intended for use in that class of molding machines in which a pressing block having a spiral compression face gives, by rotation, the molding sand which is in a flask the necessary impression, and in connection with the cylindrical molding block forms the outer mold for the pipe. A core being set in the mold, the latter is ready for casting by the usual well-known methods.

WIRE-FENCE TOOL.—C. WHIPPLE, Ashley, Ohio. This tool is specially designed for stapling wooden lath to the line-wires of wire fences. The construction is such as to hold a stay against the line-wire and the staple against the stay imbedded more or less therein, and the ends of the staple across the line wire, enabling the operator to use both his hands for the purpose of coiling the ends of the staple around the line wire at the side edges of the stay.

SEPARABLE SQUARE.—C. L. F. and M. C. HOOKER, Boca, Cal. This instrument has been invented for the use of carpenters and other mechanics and is arranged to permit of conveniently separating the members for folding the square so as to take up comparatively little space in a tool chest. When the members are fitted together and locked in place their surfaces are flush with each other, so that they may be conveniently used in the usual manner the same as any ordinary rigid square.

SCREW-DRIVER.—G. E. GAY, Augusta, Me. This screw-driver is of the ratchet type and is provided with a single pawl so arranged that it may be adjusted to cause the movement of the blade with the handle in either direction, the blade remaining stationary while the handle is turned in the reverse direction, or it may be adjusted to form a lock between the blade and handle, so that they will move together.

FENCE-LOCK.—W. B. MACLEAN, Galetta, Canada. The fence-lock is designed for securely fastening the longitudinal wires to the pickets of the fence. The lock is simple and durable in construction, very effective in operation, and may be readily applied to securely fasten or bind the parts together.

Machines and Mechanical Devices.

ACCOUNTING ATTACHMENT FOR TYPE-WRITING MACHINES.—O. L. INGRAM, Walla Walla, Wash. Mr. Ingram has provided an improved attachment for typewriters which permits of convenient addition and computation. The device may be readily secured to the machine and operated by the numeral finger-levers without in any way interfering with the ordinary work of the typewriter. By its use any number of columns of figures printed will be accurately indicated, thus making it particularly useful in tabulating, bill, and invoice work.

FRICTIONAL GEARING.—W. D. DAILEY, Polendale, West Va. In sawmills and other machine plants it is sometimes desirable to employ one motor having power sufficient to work various separate and distinct machines, and in such a plant it is sometimes necessary to stop one machine without interfering with the operations of another. For the purpose of meeting these conditions Mr. Dailey has invented an improved frictional gearing which is designed to obviate objections heretofore existing in connection with similar gearing.

COTTON ELEVATOR AND SEPARATOR.—C. R. BENEFIELD, Dallas, Texas. This invention is an improvement in that class of pneumatic elevators in which cotton or similar substances are raised and then released and deposited at a selecting point by variation of air pressure. In operation the cotton is drawn into a cotton-pipe past toothed bars and against a screen by which the dust and sand are extracted and the cotton given a downward impulse, which, being resisted by gravity, dislodges the cotton from the screen and causes it to drop into a chute. When a sufficient quantity has here accumulated, it overcomes the suction and drops downward through a valve.

LOG-RELEASING DEVICE FOR SCOWS.—E. W. SPENCER, Portland, Oregon. This invention has for its object to release chock-blocks or timbers slidably mounted on the outer ends of the inclined trusses, secured to the deck of a scow, whereby the logs held on these trusses by the chock-block or timbers are permitted to roll down the trusses and off the scow onto a wharf or other receiving agent.

GEARING.—W. L. VOSS, Harvey, Ill. This gearing is designed to be driven at different speeds and is particularly adapted for use in connection with hoisting apparatus. The mechanism comprises a driving-shaft geared directly to the element to be driven, and a second driving shaft independent of the first but connected thereto by gearing embodying a clutch automatically operative upon the movement of the second shaft, whereby the two shafts are connected and disconnected.

CHECKING-MACHINE. — F. R. WAINWRIGHT, Jersey City, N. J. Mr. Wainwright has invented an improved checking-machine designed more especially for use in restaurants and like places. The machine is arranged to print the number of each check, the amount of each check, the amount of each item on the check, the number of guests enumerated in the check, the number of the waiter, and the amount of money collected by the waiter, also a correct record of all transactions upon a continuous duplicate slip.

WASHING-MACHINE.—G. THOMAS, Gothenburg, Neb. Mr. Thomas has invented an improved rubbing surface for washing-machines of the class which employs a swinging receptacle. The rubbing surface co-operates with the rubber for the easy and thorough cleansing of fabrics of different kinds and may be easily removed. The rubber operating means can be actuated with small exertion by the attendant to allow the ready introduction or removal of the clothes.

REVERSING MECHANISM.—R. R. RECK, Marienville, Pa. This reversing mechanism is composed of comparatively few parts, not liable to get out of order, and arranged to permit of conveniently and quickly driving a shaft in different directions from a single pulley rotating continuously, at the same time allowing of using the driving pulley as a loose pulley when the parts are in intermediate position.

BUTTONHOLE-CUTTER.—L. F. MONCK, New York, N. Y. The machine will cut buttonholes in goods and incidentally mark on the goods the places where the buttons are to be attached. The construction is such that the work may be rapidly and accurately done, resulting in economy of labor and time and consequently reducing the cost of production of the garments.

TIME-STAMP.—N. COLLINS, Monument Square Chambers, London, Eng. The apparatus will print a record of the hour and minute at which the time stamp is operated. The device is primarily intended for use in connection with a cash register for denoting the time in which each transaction is recorded.

Medical Apparatus.

VAGINAL INJECTOR.—A. ANDERSON and M. B. S. B. PACKNESS, Denver, Col. This injector is capable of expanding the vagina to its fullest extent, laying open the mouth and entire lower parts and sides of the uterus, thus permitting every part of the female organs to be thoroughly douched. By reason of its perfect shape the apparatus can be safely and easily introduced and as easily withdrawn.

Railway Improvements.

PASSENGER-CAR.—J. M. OSGOOD, Boston, Mass. Certain new and useful improvements have been invented by Mr. Osgood for use on passenger cars, whereby perfect ventilation and heating are obtained. The method of ventilation is not only operative for winter service, but is just as applicable for cooling purposes in the summer. Two compartments in a section of a car when made up for night use are separate and distinct from each other, each having its own ventilator. The occupant of a berth can open a corresponding register and receive a cooling breeze from below, if desired, and the arrangement is such that no cold draft will fall upon him.

TRACK-INDICATOR.—S. A. STAEGE, Hutchins, near Mattoon, Wis. The device is adapted to indicate the variation in the distance of railway rails from each other, so as to enable persons to detect any spreading of the rails. The appliance is intended especially for use on hand-cars, so that the trackmen in going over the road need only to run the car over the rails to detect any spreading thereof.

DUST-GUARD.—J. S. PATTEN, Baltimore, Md. The dust-guard is adapted for use in car-axles boxes and comprises a novel, simple construction which can be cheaply made, will fit any ordinary car-axle box and will be durable and efficient in use to prevent the entrance of dust in the bearings.

Miscellaneous Inventions.

FAN ATTACHMENT FOR ROCKING-CHAIRS.—E. O. M. HABERACKER, Altoona, Pa. This device can be readily attached to a chair so that as the chair is rocked to and fro the fan will be operated. The improvement lies in the simplicity and ease with which the attachment may be affixed to the chair. The device may also be folded back out of the way and locked against operation whenever desired.

DARNING-LAST.—MARY G. TILNEY, Orange, N. J. The darning-last is made cup-shaped and has a substantially ovate contour. It is provided at the upper edge with a shoulder so that the stocking may be clamped thereon by means of a wire frame designed to engage this reduced portion. The material is thus properly held for darning.

PLASTER COMPOSITION.—M. T. J. OCHS, Allentown, Pa. This plaster comprises powdered hydraulic cement, 2 parts; powdered silicate of aluminium, 1 part, and powdered carbonate of lime, 1 part, the silicate of aluminium and carbonate of lime being in a raw state saturated with water, and all the powdered substances being admixed together.

TABLE.—G. H. BULLOCK, Wakefield, R. I. This table is particularly designed as a dining table and is provided with a stationary outer section of sufficient width to accommodate the covers for the guests and a center revolving section upon which food is to be placed, whereby each guest by revolving the center section can gain convenient access to any dish thereon.

COVERING FOR DEMIJOHNS.—J. G. BAHR, Brooklyn, N. Y. This improved covering for demijohns is easily applied and is arranged to protect the glass vessel against pressure, to provide a firm handle, and to retain the contents of the glass vessel in case the sides thereof become cracked.

LEAD PENCIL.—L. C. BENITZ, Philadelphia, Pa. The invention belongs to that class of pencils whose leads are adapted to slide freely and are secured in any position by means of an elastic device arranged to work in frictional contact therewith. Mr. Benitz has devised an improved means for holding the lead very firmly against upward movement and preventing it from rotation on its axis, but it may be readily drawn out when required.

REIN-GUARD.—J. T. WEST, Bowling Green, Ky. Mr. West has invented an article which may be attached or detached from the harness, and will not detract from the appearance of the harness, but will serve to effectually guide the reins and prevent them from becoming entangled with the tail of the horse and from catching in parts of the harness.

HYDROCARBON-BURNER.—M. W. MORGAN, Mount Vernon, Ind. The improvements are adapted for burners of gas, generated from gasolene or other hydrocarbon oil. The burner is of simple construction, arranged for either house or street lighting purposes and designed to give a strong, white light with a very small consumption of oil.

METHOD OF PRODUCING FIGURED PILE FABRIC.—OTTO TIMME, New York, N. Y. The invention provides an improved method of producing figured pile fabrics in a simple and economical manner, and forming, without the use of a jacquard, the desired pattern in relief, and for closely imitating in color a jacquard-produced pile fabric.

BOTTLE-WASHING BRUSH.—C. K. VOLCKENING, Brooklyn, N. Y. This brush is designed for use in connection with bottle washing machines and it embodies a novel means for preventing the rubber brush from slipping off the expanding fingers. Another improvement lies in the construction of the brush, which permits of thoroughly cleaning all parts of the bottle bottom.

MOLD FOR ARTIFICIAL TEETH.—THOMAS STEELE, Red Bank, N. J. Improved means have been provided by Mr. Steele for forming artificial teeth which permits individual adjustment of the core pins and permit of accurately setting the core pins relative to the tooth forms to ensure proper formation of the teeth.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 2989.—For manufacturers or dealers in collapsible tubes suitable for paint, ointment, etc.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 2990.—For ozonin for bleaching fabrics.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 2991.—For makers of spinning looms for cotton cloths operated by foot power.

WATER WHEELS. Alcott & Co., Mt. Holly, N. J.

Inquiry No. 2992.—For makers of machines for spinning tapes or bobbins ⅜-inch or under width.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 2993.—For makers of machines for making pearl buttons.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 2994.—For small paper or celluloid capsules, for keeping powder air tight, or nearly so.

Metal Stamping Co., Niagara Falls, N. Y., cuts and forms sheet, bar, rod, or wire any shape.

Inquiry No. 2995.—For machinery for making cotton batting and felted cotton for making mattresses.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Bldg., Rochester, N. Y.

Inquiry No. 2996.—For a machine for separating fiber from the pulp.

Die work, experimental work and novelties manufactured. American Hardware Mfg. Co., Ottawa, Ill.

Inquiry No. 2997.—For manufacturers of talcum powder boxes.

Partner wanted to exploit invention. Butter showcase and keeper, all glass. M. J. Goldsmith, Warrentown, Pa.

Inquiry No. 2998.—For makers of spring motor ceiling fans.

We design and build special and automatic machinery for all purposes. The Amstutz-Osborn Company, Cleveland, Ohio.

Inquiry No. 2999.—For manufacturers of scrubbing, blacking and clothes brushes.

Special and Automatic Machines built to drawings on contract. The Garvin Machine Co., 149 Varick, cor. Spring Streets., N. Y.

Inquiry No. 3000.—For castings for small motors and dynamos.

IDEAS DEVELOPED.—Designing, draughting machine work for inventors and others. Charles E. Hadley, 584 Hudson Street, New York.

Inquiry No. 3001.—For dealers in second-hand gasoline engines and launches.

WANTED.—A partner in competing for the bonus offered by New Zealand for a new gold-saving device. P. McEntee, Montgomery, Minn.

Inquiry No. 3002.—For a hand illuminating gas igniter (not to be attached to burner).

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 3003.—For parties to manufacture hooks and eyes.

Patents developed and manufactured, dies, special tools, metal stamping and screw machine work. Metal Novelty Works Co., 43-47 S. Canal St., Chicago.

Inquiry No. 3004.—For makers of machines for grinding leather.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 3005.—For a clock with a registering dial for use on vehicles, to register time of the journey and stops.

WOODWORKING MACHINERY.—The advertiser, who has invented and designed for others a line that has brought large returns, is looking for capital against experience and know how. None but mutually satisfactory arrangements desired or expected. Address Experience, Box 773, New York.

Inquiry No. 3006.—For parties to do twisted wire work in large quantities.

WANTED.—Several experienced mechanical and structural draughtsmen. Call Employees Registration and Bonding Company, 61 and 63 William Street, New York.

Inquiry No. 3007.—For power machines for perforating sheet metal.

Inquiry No. 3008.—For coffee mills run by hand or foot power.

Inquiry No. 3009.—For makers of block tin flasks.

Inquiry No. 3010.—For makers of furniture-hardware.

Inquiry No. 3011.—For the address of the United States Machine Co.

Inquiry No. 3012 —For manufacturers of interior woodwork.

Inquiry No. 3013.—For makers of amusement devices, merry-go-rounds, etc.

Inquiry No. 3014.—For makers of handle machinery.

Inquiry No. 3015.—For a machine for sanding and polishing sad iron handles.

Inquiry No. 3016.—For makers of gas machines.

Inquiry No. 3017.—For makers of moving picture machines.

Inquiry No. 3018.—For makers of ice machines of small capacity.

Inquiry No. 3019.—For a hand power ice machine for making 20 to 30 pounds of ice in one operation.

Inquiry No. 3020.—For machinery and information for the manufacture of brooms.

Inquiry No. 3021.—For pneumatic motors and appliances for furnishing the air.

Inquiry No. 3022.—For rough castings of the Fleming & Morgan motor.

Inquiry No. 3023.—For makers of lightning rods.

Inquiry No. 3024.—For a five hundred-light dynamo.

Inquiry No. 3025.—For small wheels for register work, to show numbers registered.

Inquiry No. 3026.—For a rectifier for changing an alternating current to a direct current.

Inquiry No. 3027.—For economical pumps or apparatus for lifting quantities of water for irrigation.

Inquiry No. 3028.—For machinery for canning fruit on a small scale.

Inquiry No. 3029.—For machinery for a tannic acid plant.

Inquiry No. 3030.—For oil burners for boilers.

© 1902 SCIENTIFIC AMERICAN, INC.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

August 5, 1902,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acet salicyl phenetidin and making same, S. L. Summers 706,356
Acid and making same, alkyloxymethyl ester of salicylic, J. Callsen 706,018
Acid and making same, methylene disalicylic, S. L. Summers 706,354
Acid, extracting ellagic, A. Heinemann 706,411
Air-brake, F. A. McKelvey 706,252
Air-brake attachment, A. L. Tibbits 706,363
Anesthetics, Apparatus for administering, C. K. Teter 706,358
Animal-trap, P. A. Whitney 706,470
Annealing furnace, wire, F. H. Daniels 706,031
Apron and dust-hood, combined storm, G. Walter 706,285
Automatic switch, M. Moskowits 706,083, 706,084
Automobile air-pump, J. G. Heal 706,051
Automobile driving-gear, A. Hitchon 706,415
Awl, sewing, Jones & Epsey 706,183
Awning actuating mechanism, W. H. Arnold 706,005
Axle-box for carriages or wagons, C. M. Florey 706,402
Axle washer, vehicle, C. & R. L. Bethea 706,215
Bale-tie, S. McCay 706,193
Banjo attachment, H. M. Bronson 706,381
Bank, savings, J. Cheim 706,388
Bar. See revolving bar.
Barometer, A. L. Robbins 706,112
Basket, folding, T. J. Langston 706,426
Bath-cabinet, J. W. Riley 706,476
Bath-cabinet, folding, B. D. Knickerbocker 706,069
Batteries, composition for use in secondary, C. T. J. Oppermann 706,444
Battery, W. L. Panikoff 706,340
Bearing, ball thrust, A. Ruedy 706,114
Bed-couch, extension, J. Hoey 706,178
Beet-topping machine, J. Albright 706,145
Belt-tightener, N. C. Bassett 706,009
Belting, machine, M. Gillet 706,044
Bending angle-irons, channel-irons, etc., machine for, C. Gabriel 706,310
Bicycle-grips, etc., mechanism for covering, J. A. Miller 706,249
Bicycle-handle shield, O. Schmidt 706,346
Bicycle-pedal, F. N. Cullen 706,028
Bicycle-rest, convertible, W. B. Rignell 706,453
Binder, temporary, C. K. & C. A. Reed 706,257
Blacking machine, shoe, J. Nicolet 706,091
Boiler, Mahy & Haillez 706,188
Boiler-grate, Straeten & Schneck 706,275
Boiler-tube cleaner, G. C. Quasebarth 706,200
Bottle, W. W. Holland 706,056
Bottle-neck-forming tool, E. D. Schmitt 706,344
Bottle-stopper, J. B. Crosby 706,301
Bottle, jars, or other vessels, stoppering, F. W. Margetts 706,247
Box or receptacle, D. Goldman 706,231
Bracket, T. Smith 706,122
Brake-controller, P. Muller 706,086
Brake-shoe-lubricating filler, R. D. Baldwin 706,147
Brick kiln and drier, continuous, J. F. Du Bois 706,035
Broiler and toaster, combined, P. G. Van Wie 706,502
Broom, etc., M. Young 706,144
Brush-holder, F. T. Weldaw 706,286
Bucket, bait, J. B. Hall 706,407
Buckle, J. E. Mitchell 706,080
Bulkhead-doors, means for operating, P. Hoppe 706,471
Bung and bushing, barrel, E. C. Phillips 706,103
Calculating-machine, I. Hultman 706,180
Calculating-machine, F. S. Baldwin 706,375
Camera, roll-holding, J. G. Browning 706,216
Camera, roll-holding, W. Louden 706,245
Can. See metal can.
Cane, A. Sjoberg 706,501
Cane and fishpole, combined, J. A. Ekelund 706,225
Cane, etc., device for cutting sugar, J. H. N. Wilson 706,481
Car-brake, automatic, A. W. Reed 706,452
Car-brake mechanism, A. W. Vollstorf 706,284
Car-coupling, J. L. Sutherland 706,210
Car-coupling, W. H. Stillwell 706,273
Car-coupling, E. Foster 706,405
Car-coupling attachments, spring-protecting device for railway, W. Thornburgh 706,360
Car-coupling, automatic, G. A. Hermanson 706,236
Car-door, E. D. Peppers 706,449
Car, dumping, F. Peteler 706,254
Car-fender, Ferguson & Beaudry 706,041
Cars, device for securing or releasing trap-floors for ore, J. J. Galway 706,312
Cars, Metallic hood for vestibules of, J. M. Knaus 706,424
Carbon-black-making apparatus, J. H. Mann 706,430
Carbonating apparatus, liquid, A. Rulf 706,115
Carbureter, C. Robinson 706,454
Carding-machines, combined stop and alarm mechanism for, J. W. Scott 706,261
Carriage and rocker, combined baby, J. C. Pender 706,448
Carriage foot-rest, R. Thompson 706,359
Casket, adjustable couch, J. Ernst 706,398
Caster, W. J. Sumner 706,209
Caster, D. Nickel 706,336
Caster, Nickel & Peterson 706,337
Catamenial bandages, suspending device for, E. L. Scott 706,457
Centrifugal separator, H. McCornack 706,087
Chain, drive, C. W. Levalley 706,427
Chairs, means for cutting saddle-seat bottoms for, F. O. Mechlin 706,079
Cheese-cutter, F. May 706,328
Cheese-hoop, E. J. Piggott 706,104
Chimney-top, C. J. Quinn 706,450
Churn, A. Close 706,023
Cigar-making machine, automatic, Snavely & Keller 706,267
Circuit-breaker, time-limit, H. M. Hobart 706,055
Circuit-closer, D. F. Mulkey 706,435
Clasp, C. W. Stimson 706,272
Cloth manufacturing, brushing-machine for, G. W. Voelker 706,132
Clutch, W. D. Cookson 706,391
Clutch for induction-motors, A. Schwartz 706,117
Clutch, friction, L. P. Mooers 706,081
Clutch, friction, C. A. Fisher 706,400
Clutch, reversing, A. M. Sweder 706,479
Clutch, reversing friction, A. M. Sweder 706,277
Coal-unloading apparatus, C. D. Day 706,222
Coating metal plates, apparatus for, Hammond & Dennis 706,408
Cock for air-brake mechanism, angle, M. L. Houder 706,059
Coke, making, P. Naef 706,443
Comparing handwritings or other objects, apparatus for, J. de Bruyn (Martinus G. Zoon) 706,297
Compressor, J. Stumpf 706,276
Conduit or tube, flexible, G. A. Lutz 706,076
Conveyor, F. Beck 706,294
Conveyor, endless-belt, P. M. De Jong 706,395
Cooking and canning machine, combined corn, L. S. Fleckenstein 706,401
Cooking apparatus, S. Szentjanossy 706,206
Cooking vessel, Brandenburg & Knobelock 706,014
Cooling and ventilating system, J. E. Lawrence 706,327
Copying models, apparatus for, W. A. C. Selke 706,459
Corer and parer, apple, J. P. Magney 706,428
Corset, C. A. O'Loan 706,096
Corset, E. Farcy 706,307
Counting-machine, T. W. Graham 706,048
Coupling for cables, ropes, etc., T. Darling 706,393
Crate, banana, W. H. Simpson 706,207
Crate, knockdown, H. E. Clement 706,022
Croze-cutting machine, B. G. Jayne 706,419
Cultivator, W. F. Cahoon 706,383
Cultivator plant-guard attachment, M. Christianson 706,160
Curb mold, cement or concrete, J. T. Harrop 706,410
Current meter, G. L. Gowlland 706,406
Curtain pole and hanger, S. G. Greene 706,315
Curtain, storm, J. W. Simmons 706,461
Cutter-head, F. O. Mechlin 706,078
Cycle, C. L. Horack 706,058
Damper mechanism, time, G. E. Archer 706,373
Deflector and screen, combined, C. R. McCluer 706,440
Dental flask, Brewer & Harvey 706,016
Dentures, rotary scraper for finishing artificial, T. J. Boyce 706,013
Dish-washing machine, H. F. Low 706,473
Display-bench for dog-shows, R. B. Hansell 706,316
Door-check, liquid, H. K. Jones 706,240
Door or window frame, G. Carr 706,157
Doweling-gage, hand, J. Corliss 706,392
Draft attachment, N. Merches 706,248
Draft-equalizer, W. E. Rivers 706,202
Dredge, G. McKay 706,195
Dredge and well-borer, C. Ehrenfeld 706,396
Dredge-clam, E. Chaquette 706,221
Drill. See rock-drill.
Drill-bits, means for shaping and sharpening, J. Wagner 706,135
Dyeing-machine, W. H. Fletcher 706,171
Eaves-trough protector, W. L. Meuser 706,333
Educational apparatus, W. L. Smith 706,463
Electric circuit, composite, M. H. Howell 706,318
Electric-circuit-controlling means, J. J. Wood 706,143
Electric furnace, A. Parker 706,099
Electric furnace, E. R. Taylor 706,128
Electric machine, dynamo, J. Burke 706,017
Electric machine, dynamo, H. G. Reist 706,108
Electric meter, prepayment, G. L. Gowlland 706,047
Electric motor, A. B. Holson 706,317
Electric regulator, A. R. Everest 706,039
Electrical distribution for car-lighting purposes, system of, J. L. Creveling 706,165
Electrical-distribution system, C. P. Steinmetz 706,123
Electric lighting and power system, M. Moskowitz 706,085
Electrical switches operated by electromagnets, controlling, F. Bourne 706,011
Electromagnetic switch, F. Bourne 706,012
Elevator controlling apparatus, electric, A. Sundh 706,126
End-board for farm-wagons, C. S. Morse 706,434
Engine, S. H. Short 706,120
Engines, ignition-gear for internal-combustion, Simms & Bosch 706,121
Engines, sparking igniter for explosive, J. Lizotte 706,492
Engraving-machine, pantograph, M. Barr 706,007
Envelop, J. B. Howe 706,417
Etching and in etching such surfaces, preparing surfaces for, Thibodo & Peckinpaugh 706,280
Excavator, O. B. H. Hanneborg 706,175
Eyeglass, watchmaker's, H. Tremblay 706,364
Fat-washing apparatus, D. I. Davis 706,033
Fence clip, wire, F. Canfield 706,385
Fence fastening-clip, wire, F. Canfield 706,220
File-handle, P. Bender 706,378
Filter, Young & Ueberroth 706,370
Filter-bed for chlorination-barrels, A. E. Johnson 706,472
Fire-alarm-telegraph system, R. G. Callum 706,384
Firearm lock and extractor mechanism, N. Pieper 706,199
Fireplaces, heat-regulator for, R. N. Johnson 706,182
Fireproof floor construction, Simpson & Shoemaker 706,347
Fireproof partition structure, Simpson & Shoemaker 706,348
Flask. See dental flask.
Flower support or holder, B. D. Sanders 706,258
Folding box or case, J. A. Hollem 706,057
Fruit-knife, C. W. Prentiss 706,107
Fruit-quartering device, J. Goossen 706,174
Fuel-saver and smoke-consumer, C. W. Francisco 706,229
Funnel, J. de St. Legier 706,465
Furnace, E. O. Rickard 706,496
Fuse-box, magazine, Hunt & Moon 706,062
Gage, G. Washington 706,505
Garment-stretcher, F. F. Crawford 706,026
Garment-suporting webbing, C. A. Spurgin 706,464
Gas-engine, T. Doherty 706,167
Gas generator, acetylene, A. Karg 706,067
Gas, making carbonic-acid, V. W. Riesberg 706,111
Gas-producer, J. A. Herrick 706,412
Gas-retort, C. W. Isbell 706,238
Gas traps, apparatus for protecting seals of sewer, J. P. Putnam 706,255
Gate, G. W. Simons 706,263
Gate, T. A. Hill 706,413
Gem-setting, R. S. Bieber 706,379
Glass-furnace, electric, A. Voelker 706,283
Gold and silver ores, treatment of, S. Trivick 706,365
Grading machine, road, R. E. Burke 706,382
Grain, apparatus for malting, drying or otherwise treating, J. Sleeman 706,462
Grinding-mill, centrifugal, J. H. Pendleton 706,102
Grip-actuating mechanism, S. S. Webber 706,369
Guns, range-finding attachment for, A. P. Collins 706,390
Guns with independent line of sight, apparatus for sighting, Schneider & Canet 706,345
Hair-fastener, W. P. Dun Lany 706,036
Hammer, power, W. Bauermeister 706,151
Hand-trap, J. C. Porterfield 706,342
Harrow sulky attachment, H. T. Faure 706,040
Harvester, W. S. Washburn 706,367
Harvester, beet, H. G. Hotchkiss 706,416
Harvester, corn, J. E. Wood 706,142
Harvesting-binders, grain-packer for, Thurston & Holden 706,362
Heating-furnace, F. H. Daniels 706,032
Hod elevator or hoist, F. C. Dey 706,305
Hoisting and conveying apparatus, driving mechanism for, Pillmore & Anderegg 706,105
Hoisting-machine, L. T. Pyott 706,256
Hoisting mechanism, C. W. Carman 706,019
Hook and eye, C. E. Devine 706,304
Hoop. See cheese-hoop.
Hoops, clamp for tank or like, J. Weigel 706,137
Horn-stand, F. C. Hassett 706,176
Horseshoe, calk-equipped, A. F. Schofield 706,205
Hose, hydraulic or fire, B. L. Stowe 706,466
Hot-plate, P. G. Van Wie 706,503
Hub, wheel, C. Anderegg 706,003
Hydrocarbon-burner, W. R. Jeavons 706,064
Hydrocarbon-burner, A. A. Arnott 706,486
Ice cutting or shaving machine, F. H. Lippincott 706,073
Inhaler, J. F. Breen 706,015
Ink-well, J. P. Mentzer 706,329
Insulator, L. McCarthy 706,194
Internal-combustion motor, Vogt & von Recklinhausen 706,366
Joint for pilasters, pillars, posts, etc., W. Kopp 706,070
Journal-box, G. W. Lewis 706,243
Keyboard, G. G. Allen 706,002
Key-guard, B. R. Bacon 706,006
Kinetographic apparatus, Roebuck & McMillan 706,113
Lacing-eye for shoes, etc., L. Ballbach 706,213
Ladder, store-service, A. A. Coburn 706,162
Lamp, compound incandescent electric, H. Gilmore 706,314
Lamp, hydrocarbon incandescent, G. Washington 706,504
Lamp, incandescent electric, H. Gilmore 706,313
Lampblack apparatus, J. L. Mann 706,429
Lampblack-making apparatus, J. H. Mann 706,431
Last, F. J. Shainsey 706,499
Leaching ores, etc., apparatus for, G. Moore 706,334
Lifting-jack, O. E. Fields 706,043
Liquid heating or cooling apparatus, H. Feldmeier 706,170
Liquids, clarifying, H. Lubberger 706,075
Load-binder, J. F. Neville 706,090
Locomotive-boiler, J. J. Gage 706,490
Loom, F. Barlet 706,376
Loom for weaving tufted pile fabrics, C. H. Landenberger 706,072
Loom harness-controlling mechanism, T. H. McNerney 706,335
Loom picker-check, A. St. Andrews 706,270
Loom shuttle-lock, F. A. Mills 706,190
Loom stopping mechanism, H. Cote 706,164
Loom-swivel, J. Wadsworth 706,133
Lubricator, W. F. Richards 706,201
Lubricator, F. W. Edwards 706,224
Mail-bag catcher, G. B. & J. C. Klink 706,323
Mail-bag fastener and lock, E. Stevenson 706,271
Measuring device, C. Christensen 706,389
Measuring electric currents, instrument for, W. Thomson 706,361
Metal can, J. N. Bradley 706,296
Metal-crimping machine, G. Cunin 706,030
Metal-foil fabric, H. L. Parker 706,100
Metal for electrical or other purposes, means and appliances for the manufacture of covered strips of soft, I. W. Heysinger. 706,053
Metals in a finely-divided state, producing, E. Pohl 706,475
Meter. See current-meter.
Micrometer, C. J. Banks 706,148
Millstones, grooving, J. Schweitzer 706,259
Mold.
Molding-machine, J. R. Thomas 706,130
Molding-machine, J. N. Battenfeld 706,487
Mop-head, J. C. Look 706,244
Mortar composition, E. K. Welch 706,138
Mortising-machine, C. J. Seaquest 706,458
Motive-power engine, M. T. Minogue 706,494
Motor, W. Evans 706,489
Movements and indicating positions electrically, means for transmitting, W. A. Thiermann 706,281
Nut-cracker, K. Hordish 706,179
Nut-lock, O. Baillargeon 706,212
Nut-lock, H. W. Langham 706,325
Nut-lock, F. Hart 706,409
Oar, bow-facing, R. B. Hanson 706,491
Oil-burner, Pfeiffer & Staples 706,341
Ore-separating apparatus, B. C. Cook 706,163
Ores or slimes, apparatus for the electrolytical treatment of, F. T. Mumford 706,436
Oven, baker's, G. F. Smith 706,351
Packing, metallic, A. J. Zwart 706,290
Paint, J. C. Shaw et al 706,119
Paper-blank feeding and scoring machine, Palmer & Denmead 706,098
Paper, etc., machinery for folding, packing, and stacking sheets of, R. C. Seymour 706,262
Pen, fountain, P. E. Wirt 706,140, 706,141
Permutation-lock, W. Beebe 706,152
Photographic development-case or dark cabinet, portable and separable, T. T. Patchel 706,101
Photographic shutter, W. F. Folmer 706,507
Pin, G. W. Dover 706,168
Pipe-bending apparatus, W. W. Benson 706,010
Pipe-hanger, A. J. Beaton 706,292
Planing-machine cutting-tool, E. H. Slater 706,264
Planter and fertilizer-distributer, combined seed, A. G. W. Foster, Sr 706,404
Plow, O. L. Carmical 706,386
Plow and planter, combined, Park & Pickens 706,446
Pneumatic-despatch tubes, system and apparatus for transmitting carriers in, B. C. Batcheller 706,291
Pneumatic elevator and weigher, Hilleary & Bradford 706,054
Pneumatic motor, G. B. Anderson 706,004
Poke, animal, H. E. Irish 706,063
Pole-reverser, automatic, M. Moskowitz 706,082
Precious metals from ores, extracting, L. B. Darling 706,303
Precious metals from ores, means for extracting, L. B. Darling 706,302
Preserving and storing building, J. M. Stukes 706,125
Preserving apparatus, food, M. D. Ellis 706,506
Pressure-generator, G. E. Blake 706,154
Pressure-regulator, J. L. Schureman 706,260
Printing apparatus for use with Machines for making paper bags, H. Holscher 706,237
Printing press, web, W. Spalckhaver 706,269
Propeller, vibrating, W. W. Phares 706,198
Pulp-separator, J. K. McLaughlin 706,441
Pulverized-fuel burner, F. M. Reed 706,495
Pump-spring connection, J. O. Bane 706,149
Pumping apparatus, T. G. E. Lindmark 706,187
Pumping-engine, hot-air, Lally & English 706,425
Punch, H. S. Temple 706,279
Race structure, sack, J. J. Wegner 706,467
Radiator attachment, G. W. Chipley 706,159
Radiator, warm-air, J. Clements 706,161
Rail-joint, K. Kohn 706,241
Rail-joint, H. O. Baldwin 706,374
Rail-joint, Osenbaugh & Gibson 706,445
Rail-joint fastener, J. C. Wentzel 706,469
Railway, electric, W. B. Potter 706,106
Railway, electric, C. R. Campbell 706,156
Railways, operating electric, C. R. Campbell 706,219
Rake, A. S. Elliott 706,397
Recording or registering the maximum movement of any mechanism, mechanism for, L. B. Atkinson 706,146
Releasing-hook for handling logs, etc., E. F. Marr 706,246
Resistance of resilient devices, means for automatically regulating, P. C. Ewart 706,306
Reversing mechanism, O. Crosby 706,027
Revolving bar or counter, P. J. O'Brien 706,094
Riddle, E. Huber 706,061
Ring. See separable ring.
Rivet heating and distributing system, V. R. Browning 706,155
Rock-drill, percussive, Z. W. Daw 706,394
Rotary engine, W. J. Mason 706,077
Rotary engine, A. P. Charles 706,158
Rotary engine, W. Alsop 706,372
Rotary engine, G. E. Woodard 706,485
Rotary motor, R. C. Sayer 706,116
Rotary motor, C. A. & O. W. Hult 706,181
Ruffling and sewing machine, R. G. Woodward 706,484
Rule, measuring, A. Latshaw 706,242
Ruling device, B. H. Joy 706,066
Sash-balance, J. Barrow 706,008
Sash-fastener and shade-support, combined, E. A. Sacket 706,456
Saw, double-acting, G. R. Peart 706,447
Sawmill-carriages, offset mechanism for, J. J. Galway 706,311
Sawmill-feed, A. C. Osborn 706,339
Scale for railway mileage-books, computing, J. G. Goldfoot 706,046
Scale, price, L. T. Johnson 706,239
Scale, price, H. B. Sherwood 706,460
Scraper, wheeled, T. D. Radcliffe 706,343
Scuttle, bucket, etc., E. M. Lockwood, Jr 706,074
Separable ring, C. A. Kellogg 706,322
Sewer-pipe connection, F. W. Carlson 706,298
Sewing edgings, guide for, J. Davis 706,166
Sewing machine, button, B. T. String 706,124
Sewing machine, eyelet, D. Noble 706,253
Sewing-machine folder, Swift & Burk 706,278
Sewing-machine hemming attachment, T. F. Dennison 706,223
Sewing-machine presser-foot-locking mechanism, H. A. Klemm 706,068
Sewing-machine take-up and tension, A. Godfrey 706,045
Shade-bracket, F. Yahn 706,287
Shade-holder, T. B. Nowlin 706,093
Shaft-mounting, H. McCornack 706,088
Shield, adhesive, W. J. Muller 706,250
Shoe-turning machine, A. Eppler, Jr 706,038
Shutter, window, J. G. Busch 706,217
Sifter, ash, I. H. Taylor 706,129
Signaling system and apparatus used therein, electric, R. G. Callum 706,218
Silo, G. W. Manlove 706,189
Siphon for dispensing liquids, A. Kleinfeldt 706,423
Skirt-supporter, L. H. Flory 706,172
Skirt-supporter, L. E. Hacherelle 706,232
Smoke-consumer, W. T. Keogh 706,420
Speed device, variable, Hanson & Gordon 706,049
Speed mechanism, variable, R. K. Le Blond. 706,186
Speed-regulator, J. E. Johnson 706,321
Spinning and twisting frame, ring, A. Hitchon 706,414
Spoke-tightener, V. J. La Bauve 706,071
Square and protractor, combination, E. Oehrle 706,095
Stacker, hay, T. Cascaden, Jr 706,299
Stacker, pneumatic, J. H. Elward 706,037
Stacker, straw, J. B. Bartholomew 706,214
Staging-clamp, J. Lally 706,185
Stamp attaching and affixing machine, J. A. Chambliss 706,387
Steam engine, J. A. Jenney 706,320
Steel, manufacturing basic Bessemer, S. McDonald 706,089
Stirrup-strap, L. P. Wellman 706,468
Stone-handling apparatus, C. N. Owen 706,197
Storage system, J. R. Rector 706,451
Stove, gas, C. Forster 706,309
Stove, heating, H. R. Oney 706,097
Stove-leg, extension, J. Barbee 706,377
Street-sprinkling device, automatic, T. D. Young 706,289
Stretcher, F. X. Aigner 706,371
Strong light body and producing same, J. E. Seeley 706,498
Suit-hanger, Salmon & Mitchell 706,497
Support, adjustable, A. Fleming 706,228
Suspenders, J. M. Sundean 706,357
Suspension-clamp, J. R. Fletcher 706,227
Switch, G. H. Smith 706,266
Switch-controlling apparatus, fluid-pressure electric, A. Sundh 706,478
Switch-operating mechanism, G. L. Cooper 706,024
Tack-machine form, F. A. Snell 706,268
Talking-machine, coin-operated, B. G. Royal 706,203
Tank or ice-chest, T. B. Rogers 706,455
Telegraph-transmitter, mechanical, J. W. McDonald 706,251
Telegraphy, wireless, H. Shoemaker 706,500
Telephone-circuit, I. H. Farnham 706,308
Telephone-circuit, M. H. Howell 706,319
Telephone-mouthpiece, antiseptic, English & Burns 706,169
Tempering-vat, churn, and butter-worker, combined, P. M. Sharples 706,118
Thermocauter, L. Wirsching 706,482
Thermostats, means for testing, T. M. Heaphy 706,177
Tie. See bale-tie.
Tiles, setting, J. H. Munro 706,474
Tire-inflating device, pneumatic, Claesgens & Magin 706,021
Tobacco-hoister, W. P. Henry 706,052
Tongs for handling ingots, etc., J. M. Lafferty 706,324
Tool, J. H. Koch 706,184
Tool, compound, W. Offut 706,196
Torch, E. H. Wagner 706,134
Toy, F. D. Rettich 706,110
Toy, H. T. Kingsbury 706,421
Toy bank, H. T. Kingsbury 706,422
Toy cannon, A. G. Fifer 706,399
Toy fence, portable, C. J. Youse et al 706,288
Traction-engine, R. L. Morton et al 706,191
Train-connector, electric, Felt & Kimbark 706,226
Train-control system, F. E. Case 706,020
Train-lines, cut-off device for, G. C. Moore 706,433
Train-starting mechanism, J. B. Blood 706,295
Tread or tire, pneumatic, F. L. Beamond 706,293
Triangle, C. W. Fuller 706,230
Trolley-pole catch, J. A. Norton 706,092
Trolley-track switch, overhead tubular, P. F. Werner 706,139
Trolley-wheel, R. H. Apelt 706,211
Trolley-wire finder, L. C. Nolan 706,338
Trousers-hanger, J. H. Howe 706,060
Trousers-supporter, L. O. Miller 706,493
Truck-frame for railway-cars, J. M. Hansen 706,233, 706,234
Tunnels, constructing, J. Breuchaud 706,380
Twyer, furnace, E. H. Messiter 706,332
Tying device, parcel, Dean & Thomas 706,034
Type-writer-cover hook, E. A. Smith 706,350
Type-writers, paper-feeding machine for, H. C. Tobey 706,282
Type-writing machine, E. B. Cram 706,025
Type-writing machine, M. W. Weir 706,136
Umbrella-stick, T. H. Smith 706,352
Underskirt, lady's, C. L. Hermann 706,235
Universal joint for shafting, J. L. Follett 706,403
Valve, fluid-pressure-regulated gas, A. Beler. 706,153
Valve for gas or gasolene engines, mixing, R. E. Hardy 706,050
Valve for steam-engines, distributing, C. Tuckfield 706,131
Valve, self-closing, F. H. Mason 706,432
Valve, throttle, J. S. Chambers 706,300
Vegetable-roots, machine for cutting, H. Webb 706,368
Vehicle, motor, H. M. McCall 706,439
Vehicle, running-gear, H. A. Wise 706,483
Vehicles, machine for handling, G. E. & J. S. Myers 706,437
Veneer-box-making machine, W. H. Stout 706,274
Veneer-cutting machine, L. G. Merritt 706,331
Voting-machine, W. Langrill 706,326
Washboard, S. McCay 706,192
Washing-machine, W. Sparkman 706,353
Washing-machine, A. C. Israel 706,418
Watch-winding device, G. M. Sawyer 706,204
Water-bottles, water-bags, etc., package for, E. E. Menges 706,330
Water-wheel, T. S. Barwis 706,150
Weigher, automatic grain, A. & J. H. McLeod 706,442
Well-drilling tools, fluid-pressure apparatus for, Gallagher & Macomber 706,173
Well-measuring device, artesian, S. McCaughtry 706,438
Wheel. See trolley-wheel.
Wheel, J. J. Rowe 706,477
Wheel, A. A. Verel 706,480
Wheels on shafts, means for securing, C. C. Smalley 706,265
Whiffletree attachment, N. Reisner 706,109
Window brace and fastener, O. J. Jenks 706,065
Window-guard, Culver & Leichtentritt 706,029
Wood-plate-cutting machine, A. Smith 706,349
Wood-shapers, antifriction-collar for, T. S. Crapp 706,488
Wrench, C. C. Fields 706,042
Wrench, P. Taroli 706,127
Wrench, A. L. Slater 706,208

DESIGNS.

Badge, M. J. Kane 35,986
Flag, A. R. Conner 35,985
Range, R. H. Westerfield 35,987, 35,990

TRADE MARKS.

Bottles, prescription, Obear Nester Glass Co. 38,739
Bran, middlings, brown and white, mixed feed, and red dog, Listman Mill Co 38,723
Buttons, collar, W. J. Smith 38,703
Candy, chocolate, F. H. Dow & Co 38,719
Carbon-black, Castle Brook Carbon Black Co. 38,732
Cigars, M. J. Long 38,717
Cleaning and polishing compound, American Pottery Supply Co. of Baltimore City 38,735
Collars and cuffs, Cluett, Peabody & Co 38,711
Confectionery, certain named, J. H. Faulhaber 38,719
Dolls, E. U. Steiner 38,704, 38,705
Dress-shields having stockinet covering, rubber, Canfield Rubber Co 38,706
Electric switches, Hart Mfg. Co 38,740
Flour, wheat-food preparations, and wheat breakfast-foods, wheat, J. A. Neal 38,722
Food, prepared cereal, American Cereal Co .. 38,721
Food, stock, American Cereal Co 38,724
Foot-powder, J. W. Manning 38,729
Furniture-polish, liquid, P. Levi 38,736
Gas-fixtures, American Tank & Fixture Co .. 38,741
Gloves or mittens, Saranac Glove Co 38,712
Hats, H. G. Bartlett 38,707
Hats, Sanger Bros 38,708, 38,709
Hats, felt, Sanger Bros 38,710
Insect-powders, W. F. Steinmetz 38,731
Leather footwear, certain named, R. H. Fyfe & Co 38,713
Medicinal plasters, Raymond & Co 38,727
Medicine for certain named diseases, C. W. Bunce 38,725
Milk, modified, C. H. Pattison 38,720
Oil, rosin, S. P. Shotter Co 38,733
Paints and certain named painters' supplies, Standard Varnish Works 38,734
Pepsin compound, B. L. Maltbie 38,726
Remedies for treatment of the hair and scalp, Altenheim Medical Dispensary 38,728
Ribbons, silks, satins, and velvets, J. Kridel Sons & Co 38,714
Roofing, fabric, Kansas City Roofing & Corrugating Co 38,737
Seals, certain named, E. J. Brooks & Co 38,738
Talcum powder, H. N. Siegenthaler 38,730
Textile fabrics, cotton and silk woven, Davies Textile Co 38,715
Tickings, Amoskeag Manufacturing Co 38,716

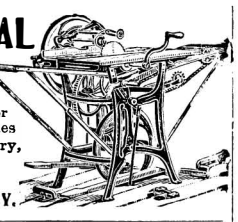
LABELS.

"Adrian," for flour, Detroit Milling Co 9,361
"Alt Nurnberger Brau," for beer, Grand Rapids Brewing Co 9,351
"Aristypho," for cigarettes, Aristypho Co ... 9,348

(Continued on page 112)

© 1902 SCIENTIFIC AMERICAN, INC.

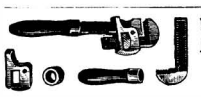
WOOD or METAL Workers



Without Steam Power should use our Foot and Hand Power Machinery. Send for Catalogues
A—Wood-working Machinery,
B—Lathes etc.
SENECA FALLS MFG. CO.
695 Water St., Seneca Falls, N.Y.

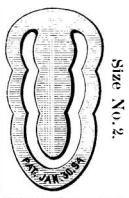
ENGINE & FOOT LATHES. MACHINE SHOP OUTFITS. TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

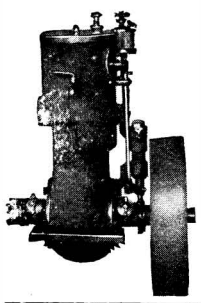
Foot and Power and Turret Lathes, Planers, Shapers, and Drill Presses. SHEPARD LATHE CO., 133 W. 2d St., Cincinnati, O.



Pipefitters!
Your kit is not complete unless it includes the famous
STILLSON WRENCH
which is particularly adapted for turning out the best work *without crushing the pipe* in the least. All parts are drop-forged. Once tried, it is always used. It has many imitations but no equals. See explanatory cuts. Price list on application to
WALWORTH MANUFACTURING CO.,
128 TO 136 FEDERAL ST., BOSTON, MASS.

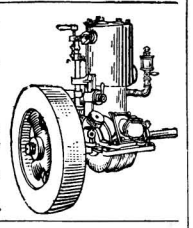
THE EUREKA CLIP
The most useful article ever invented for the purpose. Indispensable to Lawyers, Editors, Students, Bankers, Insurance Companies and business men generally. Book marker and paper clip. Does not mutilate the paper. Can be used repeatedly. In boxes of 100 for 25c. To be had of all booksellers, stationers and notion dealers, or by mail on receipt of price. Sample card, by mail, free. Manufactured by **Consolidated Safety Pin Co.,** Box 121, **Bloomfield, N. J.**

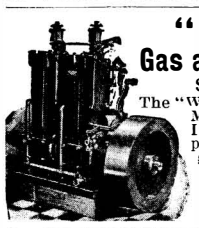




TRUSCOTT MARINE MOTORS.
The simplest, most powerful, and highest speed gasoline engines of their class upon the market.
Made single, double, and triple cylinder, both two and four cycle, ranging from 1 to 40 H. P.
Catalog for the asking.
Truscott Boat Mfg. Co.,
ST. JOSEPH, MICH.

GASOLINE ENGINES
Marine & Stationary
from 1-4 to 16 H. P.
A thoroughly satisfactory engine at a moderate price.
Write for catalogue.
THE CLIFTON MOTOR WORKS.
233 E. Clifton Ave., Cincinnati, O.

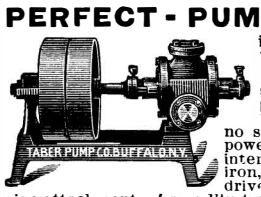




"WOLVERINE" Gas and Gasoline Engines
STATIONARY and MARINE.
The "Wolverine" is the only reversible Marine Gas Engine on the market. It is the lightest engine for its power. Requires no licensed engineer. *Absolutely safe.* Mfd. by
WOLVERINE MOTOR WORKS.
12 Huron Street,
Grand Rapids, Mich.

TOOLS FOR MECHANICS.
Send for Free Catalogue No. 16 B.
The L. S. Starrett Co., Athol, Mass., U. S. A.

PERFECT - PUMP - POWER.



is attained only in the **TABER ROTARY PUMPS**
They are mechanical simple and durable. Will pump hot or cold fluid, thin or thick. Requires no skilled mechanic. Most power at least cost. All parts interchangeable. Made of iron, steel or bronze. Can be driven by belt, motor or engine attachment. *Large Illustrated Catalogue free*
TABER PUMP CO., 32 Wells St., Buffalo, N.Y.. U. S. A.

If you want the best CHUCKS, buy Westcott's

Little Giant Double Grip Drill Chucks, Little Giant Drill Chucks Improved, Oneida Drill Chucks, Cutting-off Chucks, Scroll Combination Lathe Chucks, Geared Combination Lathe Chucks, Plain Universal Lathe Chucks, Independent Lathe Chucks. Made by
Westcott Chuck Co., Oneida, N. Y., U. S. A.
Ask for catalogue in English, French, Spanish or German.
FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

Beauty of Design
is one of the desirable features about our engine which has not been developed so much by other makers. We have the usual advantages of a good gas engine and also give you neatness and good looks, which makes an Ornament of your Power. Send for full particulars and new booklet giving sectional view.
HARDY MOTOR WORKS, Ltd.
Port Huron, Mich.

FRICTION DISK DRILL
FOR LIGHT WORK.
Has These Great Advantages:
The speed can be instantly changed from 0 to 1600 without stopping or shifting belts. Power applied can be graduated to drive, with equal safety, the smallest or largest drills within its range—a wonderful economy in time and great saving in drill breakage. ☞ Send for catalogue.
W. F. & JNO. BARNES CO.,
Established 1872.
1999 Ruby Street, • • Rockford, Ill.

"Bell's barbwire liniment," for liniment, G. W. Bell & Son 9,343
"Blue Bell," for flour, Detroit Milling Co... 9,360
"Chase & Sanborn Seal Brand Coffee," for coffee, Chase & Sanborn.....9,356, 9,357
"Colorado Rocky Mountain Cough and Catarrh Root," for a medicine, Blanchard & McIntyre..... 9,342
"Cook's Budweiser," for bottled beer, F. W. Cook Brewing Co..... 9,350
"Elixir Ovarans," for a medicine, W. H. Nelson 9,344
"Frutonic," for a tonic beverage, Southern California Chemical Co..... 9,349
"Gloria," for flour, Detroit Milling Co..... 9,359
"Hercules Rip Proof Gloves," for gloves, Schwartz, Schiffer & Co..... 9,341
"John Latour, Cognac 1858," for brandy, S. Kraus & Bro..... 9,354
"La Carolita," for cigars, C. Stutz, a firm.. 9,346
"Pink Rose Wine," for wine, Popel & Giller 9,353
"Queen Quality," for Burgundy wine, Siegel-Cooper Co..... 9,352
"Sea Wall," for coffee, Southern Coffee Co.. 9,355
"Tarquinius," for cigars, C. Stutz, a firm... 9,347
"The Famous Ripper," for cigars, J. H. Bloch 9,345
"The Lindsey," for crackers, N. B. Lindsey. 9,358

PRINTS.

"Vienna Sausage," for Vienna sausage, Armour Packing Co..... 540
"We Sell Masurite Safe Explosive," for an explosive, Masurite Explosive Co..... 539
"Zapha," for shoe-polish, K. J. Quinn & Co. 538

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

NEW BOOKS ETC.

JOHNS HOPKINS UNIVERSITY STUDIES IN HISTORICAL AND POLITICAL SCIENCE. J. M. Vincent, J. H. Hollander, W. W. Willoughby, Editors. State Banking in the United States Since the Passage of the National Bank Act. By Geo. E. Barnett, Ph.D. Baltimore: The Johns Hopkins Press. 1902. Pp. 117.

NOTES ON THE CONSTRUCTION OF THE VIOLIN. By W. B. Coventry, M. I. C. E. London: Dulau & Co. 1902. Pp. xi-80. 32mo. Price 75 cents.

Mr. Coventry has written a book which it is a pleasure to read. He tells us in a very entertaining way what elements must enter into the construction of violins, and something about the work of the old Italian and French violin-makers. The publishers have brought the book out in a very neat dress.

UNCLE SAM TRUSTEE. By John Kendrick Bangs. New York: Riggs Publishing Company. 1902. Pp. ix-342.

To the reader who knows Mr. Bangs only as a writer of very humorous tales, the present book will come almost with a shock of surprise. Many will hardly recognize the hand of the man who wrote the "House Boat on the Styx" and "Mr. Napoleon Bonaparte of Corsica." "Uncle Sam Trustee" is a brief sketch of the history of Cuba, comprising a consideration of relations which for a century or more have existed between the people of that island and our own country, a statement of the results of the Spanish war, in so far as it involved Cuba alone, and a general statement of the conditions prevailing at the beginning of the American campaign. Mr. Bangs' connection with Harper's Weekly naturally placed at his disposal a vast amount of material, which he has used in the writing of his book. The text is accompanied by many illustrations.

THÉORIE DE LA LUNE. Par H. Andoyer. Paris: C. Naud. 1902. 16mo. Pp. 86. Price 50 cents.

Prof. Andoyer has presented in this monograph of his all that we know of the mechanics of the moon. His book is simply packed with information. In the comparatively small number of 86 pages he has managed to tell us everything that the modern astronomer knows of the motions of the heavenly body which is nearest us.

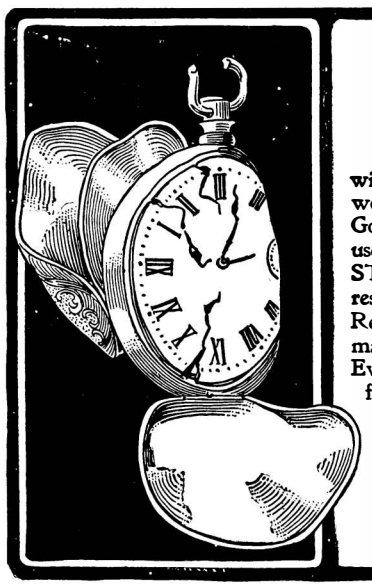
NOTES ON LEAD ORES. Their Distribution and Properties. By James Fairie, F. G. S. London: Scott, Greenwood & Co. New York: D. Van Nostrand Company. 1901. 16mo. Pp. 64. Price $1.

The late James Fairie some years ago prepared a series of technical articles on lead ores, which proved of unusual value and interest. These articles have now been collected and published in book form. Coming as they do from a painstaking and practical geologist, they should be welcomed all the more so since the literature on the subject of lead ores is only too limited.

GÉOMÉTROGRAPHIE OU ART DES CONSTRUCTIONS GÉOMÉTRIQUES. C. Naud. 1902. 16mo. Pp. 87. Price 50 cents.

Geometrography is but a mere detail in the science of geometry; but that detail is of such importance and interest that a discussion of its various phases should prove of interest. Furthermore, the comparative novelty of the topic renders a treatise in which it is discussed particularly valuable at this time.

The first part of this present book comprises a very short theory, which is nothing more nor less than the indication of notations with adopted conventionalities. The second part is a development of the preceding studies, and treats of various relative constructions well known and of exceeding importance in geometry.

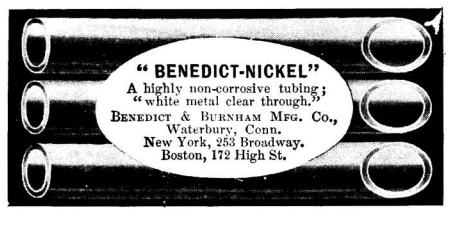


Watch Accidents
will happen! That's why your watch works should be protected by a strong case. Gold alone is soft and bends easily. It's used for show only. The JAS. BOSS STIFFENED GOLD WATCH CASE resists jar and jolt. Keeps out the dust. Reduces the expense of repair. Adds many years to the life of your watch. Every JAS. BOSS CASE is guaranteed for 25 years by a Keystone Trade-mark stamped inside. You must look for this trade-mark.
Consult the jeweler.
Write us for booklet.
THE KEYSTONE WATCH CASE COMPANY,
Philadelphia.

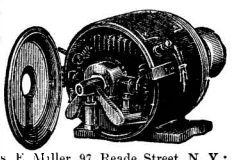
THE THOUSAND ISLANDS.

There may, be somewhere on earth, a more delightful region than that of the Thousand Islands, but if there is, it has not been discovered It is the Venice of America, but also has good hotels that can be kept warm if there shall happen to be a cold, rainy evening. It is as fine as the Bay of Naples, with 2,000 picturesque Islands scattered along the twenty-five miles of one of the most beautiful rivers in the world. You can find out a great deal regarding it in No. 10 of the "Four-Track Series," "The Thousand Islands." Copy will be mailed free on receipt of a 2-cent stamp by George H. Daniels, General Passenger Agent, New York Central & Hudson River Railroad, Grand Central Station, New York.

THE STEAM TURBINE; THE STEAM Engine of Maximum Simplicity and of Highest Thermal Efficiency. By Prof. R. H. Thurston. A valuable series of articles having cuts of some of the more efficient engines of this type the Parsons', DeLaval, Dow, etc.; with exhaustive tables giving the result of tests and much general data on the subject. Contained in SUPPLEMENT Nos. **1306, 1307** and **1308.** Price 10 cents each. For sale by Munn & Co. and all newsdealers

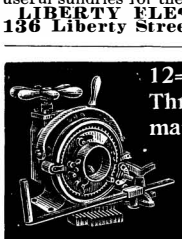

"BENEDICT-NICKEL"
A highly non-corrosive tubing; "white metal clear through."
BENEDICT & BURNHAM MFG. CO., Waterbury, Conn.
New York, 253 Broadway.
Boston, 172 High St.

Apple Economical Gas Engine Igniters.



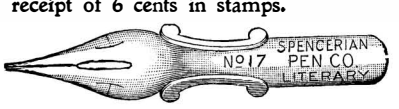
Are positively the best built for Stationary, Automobile and Marine Gas Engines, either touch or jump spark system. We are the leaders in the manufacture of Igniting Dynamos, Magnetos, Governors, Coils, Plugs, etc. Write for printed matter. **The Dayton Electrical Mfg. Company,** No. 80 South St. Clair St., Dayton, Ohio, U. S. A.
New York stock carried by Chas E. Miller, 97 Reade Street, N. Y.; Philadelphia Office, The Bourse; Chicago Office, 19-21 La Salle Street. St. Louis stock carried by A. L. Dyke, Linmar Building.

ALL WHO OPERATE AUTOMOBILES, LAUNCHES and MOTOR CYCLES will find our booklet interesting reading. It describes spark plugs, batteries and other useful sundries for the gasolene motor. Sent free.
LIBERTY ELECTRICAL SUPPLY CO.,
136 Liberty Street, New York.



12-inch Pipe cut off and Threaded with ease by one man and a
FORBES PATENT DIE STOCK
Smaller sizes proportionately easy. *Send for Catalogue.*
MACHINE No. 30. Range ¼-2 in. R. & L.
THE CURTIS & CURTIS CO.. 6 Garden St., Bridgeport, Conn.

SELECT A PEN
Suitable for your handwriting from a sample card of 12 leading numbers for correspondence, sent postpaid on receipt of 6 cents in stamps.
SPENCERIAN PEN CO.
349 Broadway, New York.



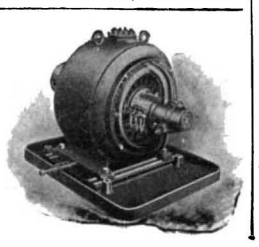
A. W. FABER
Manufactory Established 1761.
LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, INKS, STATIONERS' RUBBER GOODS, RULERS, ARTISTS' COLORS.
78 Reade Street, New York, N. Y.
GRAND PRIZE, Highest Award, PARIS, 1900.

Rider Agents Wanted

in each town, to help us sell overstock of high grade bicycles at *half factory cost.*
New 1902 Models.
"Bellise," compete $8.75
"Cossack," Guaranteed High Grade $9.75
"Siberian," a Beauty $10.75
"Neudorf," Road Racer $11.75
no finer bicycle at any price.
Any other make or model you want at one-third usual price.
Choice of M. & W. or Record tires and best equipment on all our bicycles. *Strongest guarantee.*
We **SHIP ON APPROVAL** C. O. D to any one *without a cent deposit* & allow **10 DAYS FREE TRIAL** before purchase is binding.
500 good 2nd-hand wheels $3 to $8.
DO NOT BUY a bicycle until you have written for our free catalog with large photographic engravings and full descriptions.
MEAD CYCLE CO. Dept. 59W, Chicago.

WELL DRILLING Machines
Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog.
WILLIAMS BROS., Ithaca, N. Y.

The Eck Electrical Machinery
embodies all desirable features known to the art. Highly efficient, durable, noiseless, well finished. Making a limited line from 1-32 to 5 H. P. In large quantities we can make them right and sell them right. Get the best. 32,000 sold.
Eck Dynamo and Motor Works, Belleville, N. J.



Scientific American Building Monthly
VOL. 33.
JANUARY--JUNE, 1902.
278 Illustrations. 120 Pages, 6 Tint-Blocks.
The Thirty-Third Volume of this beautifully illustrated and finely printed Monthly Magazine, comprising the numbers January to June, 1902, is now ready.
. . . SPECIAL FEATURES . . .
ILLUSTRATIONS. . .
The volume contains 6 tinted cover pages and 278 illustrations, including many fine examples of recent dwellings, gardens, views of groups and estates, interiors, exteriors and plans. Photographs of agricultural details, porches, doorways, mantels, etc., are especially helpful and suggestive. The illustrations of the Building Monthly are made from specially taken photographs and are not obtainable elsewhere. Most of the houses are accompanied with full sets of plans.
TALKS WITH ARCHITECTS. . .
This interesting series of conversations with eminent architects by Mr. Barr Ferree comprises important talks with Mr. Thomas Hastings on "Some Suggestions for New York"; Mr. William J. Fryer on "The New Tenement House Law of New York"; Mr. Charles A. Rich on "The Development of the Small College"; Mr. John Galen Howard on "The Beaux-Arts Architects"; Mr. J. Monroe Hewlett on "The Architect and the Municipality"; and Mr. George L. Morse on "The Durability of Steel Construction."
EDITORIAL ARTICLES. . .
Suggestive discussions on timely subjects for the home-builder: "Municipal Art"; "Roads and Houses"; "Washington the Magnificent"; "The House and the Terrace"; "The Art of Home-Building"; "Kitchen Ends and Back Yards."
DEPARTMENTS. . .
The Departments of the Monthly cover a wide range of topics and summarize the latest advance in current architectural thought and practice: "Monthly Comment"; "The Household"; "The Garden"; "Legal Decisions"; New Books"; "Country Life"; "The Country House"; "Fire Protection"; "Sanitation"; "Civic Betterment"; "New Building Patents"; "Publishers' Department."
The SCIENTIFIC AMERICAN BUILDING MONTHLY is a national magazine of architecture conducted with special reference to domestic architecture. Its text abounds with practical suggestions and its illustrations cover a wide range of subjects selected with scrupulous care and printed in the most artistic manner.
Price, Express Paid, $2.00.
MUNN & CO., Publishers, 361 Broadway, New York

© 1902 SCIENTIFIC AMERICAN, INC.

The First Step to Success

is technical training for the work in which you propose to succeed. For ten years we have been training ambitious people to succeed.

Write to-day for circular showing how you can get the

TECHNICAL TRAINING BY MAIL

required by a Mechanical Engineer, Mechanical Draftsman, Steam Engineer, Electrical Engineer, Electrician, Telephone Engineer, Civil Engineer, Surveyor, Mining Engineer, Architect, Architectural Draftsman, Sign Painter, Letterer, Analytical Chemist, Ornamental Designer, Bookkeeper, Stenographer, Teacher, Cotton Mill Superintendent, Woolen Mill Superintendent, to Speak French, to Speak German, to Speak Spanish. State position you want.

International Correspondence Schools, Box 942, Scranton, Pa.

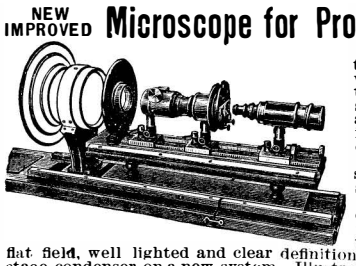
EARN MORE Study in spare time. We teach you what you need to know to earn more in your own business or another. **Engineering, Drafting, Art, Architecture, Mining, Metallurgy, Business, Stenography, Journalism, Bookkeeping, etc.**

Write for free catalogue 6, with full particulars.

Special Discounts Now.

THE CONSOLIDATED SCHOOLS, 156 Fifth Ave., N. Y.

NEW IMPROVED Microscope for Projection.



New metal track plate with keys to unlock standard and change instantly — combining also polariscope and stamoscope. New series of projection objectives with flat field, well lighted and clear definition. New substage condenser on a new system. Illustrated circular, catalogue, etc., free.

QUEEN & CO., 1010 Chestnut St., Philadelphia, Pa.

A Ground Floor Proposition

FROM

THUNDER MOUNTAIN

The Newly Discovered Gold District. The Richest in the World.

THE RAND GOLD MINING CO.

OF

THUNDER MOUNTAIN

offers a limited amount of stock for development purposes

AT A LOW PRICE

Write for prospectus and full particulars.

For prompt attention address,

Mining Department, Room 1119,

THE MUTUAL SECURITY & TRUST COMPANY,

Subscription Agents.

279 Dearborn Street, - - - - - - Chicago, Ill.

D. L. HOLDEN

REAL ESTATE TRUST BLDG PHILA., PA.

SOLE MANUFACTURER

REGEALED ICE MACHINES

SEE FIRST PAGE SCIENTIFIC AMERICAN SEPT. 2. 1899.

JUST PUBLISHED

Practical Pointers For Patentees

Containing Valuable Information and Advice on

THE SALE OF PATENTS.

An Elucidation of the Best Methods Employed by the Most Successful Inventors in Handling Their Inventions.

By F. A. CRESEE, M. E.

152 Pages. Cloth. Price, $1.00.

THIS is the most practical, up-to-date book published in the interest of Patentees, setting forth the best methods employed by the most successful Inventors in handling their patents. It is written expressly for Patentees by a practical Inventor, and is based upon the experience of some of the most successful Inventors of the day.

It gives exactly that information and advice about handling patents that should be possessed by every Inventor who would achieve success by his ingenuity, and will save the cost of many expensive experiments as well as much valuable time in realizing from your inventions. It contains no advertisements of any description and is published in the interests of the Patentee alone, and its only object is to give him such practical information and advice as will enable him to intelligently handle his patent successfully, economically and profitably.

It gives a vast amount of valuable information along this line that can only be acquired by long, expensive experience in realizing from the monopoly afforded by a patent.

Send for Descriptive Circular.

MUNN & CO.,

Publishers, 361 Broadway, New York.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled

(8661) I. L. asks how to metalize insects so as to render them capable of coating by the galvanoplastic process. I have tried phosphorus and bisulphide of carbon, but find it very dangerous, as it is liable to burst into flames instantly. A. Dissolve 1 ounce of phosphorus in 1 pound of bisulphuret of carbon by frequent agitation. Add to this solution 1-3 pound of beeswax and mutton tallow 1-3 pound. Dissolve by gentle heat and guard against fire, as the mixture is very inflammable. To this add 1 pint of spirits of turpentine and 2 ounces of pure unvulcanized rubber dissolved with 1 pound of asphaltum in bisulphate of carbon. When the solution is complete, it can be applied to insects, flowers, etc., which are then dipped in a weak solution of nitrate of silver or chloride of gold. In a few minutes the articles are covered with a thin film of metal. They can be plated in the usual way.

(8662) E. H. writes: I have need of a resistance of 25 ohms in the form of a strip of German silver ⅜ inch wide, 24 inches long. How thick must it be, or what gage? If I should use it ½ inch wide, 24 inches long, what gage must I use? A. To get 25 ohms resistance with a strip of German silver ½ inch wide and 24 inches long will require that it be five millionths of an inch thick. If it be ⅜ of an inch wide, it may be a thought thicker. German silver has 13 times the resistance of copper. Hence a copper wire for the same size might be 26 x 2 feet or 26 feet long. And if 26 feet have 25 ohms, one ohm will be 1.04 feet long. Our wire table gives No. 39 wire as having 1.20 feet per ohm, which is near enough. Hence a German silver wire of the same size would have 25 ohms for a length of 2 feet. The problem then is to find the thickness of a plate whose sectional area is as great as a No. 39 wire, and whose width is a half inch. The diameter of the wire is 0.00353 inch. Its area is 0.00001 square inch. One-half of this is 0.000005 inch.

(8663) R. R. S. asks: Why cannot the high-voltage alternating currents induced in the secondary of an induction coil be changed to direct currents and used the same as other currents of high voltage? A. The induction of an alternating e. m. f. is a necessity of the action of an interrupted direct current. When the primary circuit is made, the induced current in the secondary is in the opposite direction from the current which induced it, since that is the proper effect of an increase of magnetic flux upon the turns of the winding: when the primary circuit is broken, the opposite effect is produced, and the induced current is in the same direction as that of the current which induced it. The induction of an alternating current by an interrupted direct current is therefore a necessity. Now, as to the transformation of such an alternating current into a direct current. When a condenser is employed with an induction coil, the induced e. m. f. upon making the primary circuit is much weaker than that which is set up by breaking the circuit. Because of this fact, when the spark terminals of an induction coil are separated so far that the e. m. f. set up upon making the primary circuit cannot throw a spark across the gap between them, the spark passes only upon the breaking of the primary circuit, and the induced current is a direct current, acting by impulses, there being as many impulses per second as there are interruptions of the primary current at the vibrator or interrupter. This is the method in which induction coils are ordinarily used for experiments. If one would see the spark at making the primary circuit, he can produce it by bringing the spark terminals nearer together, till a spark is produced upon making the primary circuit. This spark is from positive to negative in the opposite direction from the spark upon breaking the primary circuit. No way has been discovered for using such an arrangement as a source of power or for lighting lamps, so that it can compete with the alternating-current dynamo, generating an electromotive force high enough for all practical purposes. Any transformer is operated at some loss, and the induction coil, throwing a spark through a wide gap of air, is not an economical transformer.

PERFORATED METALS OF EVERY DESCRIPTION AND FOR ALL USES.

THE HARRINGTON & KING PERFORATING CO.

225 N. UNION ST. CHICAGO, ILL. U.S.A.

THE LIFE OF MACHINERY

depends on the careful treatment of it. Nothing so reduces the wear and tear and aids it in smoothly running as

Dixon's Pure-Flake Graphite

This lubricant reduces the chance of breakage, prevents much delay, is not affected by heat or cold, by acids or alkalies. It is sold regularly wherever once tried. Write for booklet . . .

JOSEPH DIXON CRUCIBLE CO.

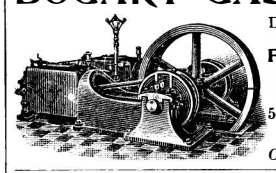
Jersey City, N. J.

NEW CINCINNATI FIRM.

The "Rapid" Tool and Machine Co., of 814, 816, and 818 Broadway, Cincinnati, O.,

have just completed a manufacturing plant and are ready to take orders for general tool and die sinking, metal engraving, metal stamping, metal patterns and models, designing and building of special machinery for rapid manufacturing of small metal goods, toys and notions. They will manufacture by contract for the wholesale trade and have made a specialty of working sheet aluminum. They are fixed up to make a fine piece of work in aluminum spinning and also in manufacturing aluminum castings for any purpose. They are equipped to do mechanical as well as electrical experimental work, Patent Office models and guarantee their work.

BOGART GAS ENGINES



Double Cylinder, 50 h. p. and upward to 500.

FARRAR & TREFTS, Steam Engine & Boiler Works....

54 to 56 Perry Street, BUFFALO, N. Y.

Catalogue on Application

THE ELECTRIC HEATER.—A VALUable paper, with working drawings of various forms of the electrical heaters, including electric soldering iron, electric pad for the sick, etc. 6 illustrations. SCIENTIFIC AMERICAN SUPPLEMENT 1112. Price 10 cents. For sale by Munn & Co. and all newsdealers.

BURNISHINE

The most marvelous metal polish in the world.

Contains no Acids or anything injurious to the Metal or Hands.

Produces a wonderful brilliant lustre on Brass, Copper, Tin, Zinc, Silver, Nickel and all Metals.

A few rubs and the article is handsomely burnished.

Will not soil the hands or leave deposits in corners or surface of the metal.

Will restore burnt or rusty Nickel on Stoves to its original lustre.

Put up in cans at prices as follows: ½ Pint, 25c. 1 Pint, 40c. 1 Quart, 60c.

If your dealer does not keep it write direct to **J. C. PAUL & CO., 59 Dearborn St., Chicago.**

Millen's French Satin Jr.

The STANDARD blue print paper of the world—not the ordinary kind, but a *perfect* paper for photographic work, perfectly made and perfectly packed in sealed tubes. The delight of the professional and amateur PHOTOGRAPHERS. There is no better, it is the best. A postal card will bring full information of French Satin Jr. and our other photographic specialties.

THE J. C. MILLEN, M. D., PHOTOGRAPHIC CHEMICAL CO., Denver, Colo.

FOOT-POWER LAUNCH with ADJUSTABLE SEATS.

Sometimes when a man starts a Gasoline Launch he says something. **Our Foot-Power Launches go without saying.** We also manufacture Gasoline Launches, Canoes (Canadian Model), St. Lawrence Skiffs. We build to any model specified. The Launches we carry in stock are the most suitable for our boat motors.

DURAND MFG. CO., 219 South Avenue, Rochester, N. Y.

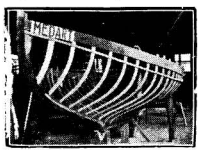
DO YOU USE GRINDSTONES?

If so we can supply you. All sizes **mounted** and **unmounted, always** kept in stock. Remember, we **make a specialty** of selecting stones for **all special purposes.** *Ask for catalogue.*

The CLEVELAND STONE CO.

2d Floor, Wilshire, Cleveland, O.

The MEDART SYSTEM



of supplying Boat Building Materials enables anyone ordinarily handy with tools, to build boats of the highest character at one half the boat factory's price. Freight low. Launches, Sailing Yachts and Row Boats.

Send stamp for catalog.

FRED MEDART, 3545 DeKalb St., St. Louis, Mo.

BETTER THAN GOVERNMENT BONDS

7 Per Cent. Preferred Shares

(A lien on everything the Company owns)

with a common stock bonus, that will, according to a conservative estimate, bring up the earnings of your investment to

40 PER CENT A YEAR

are offered in a Company whose products are an **industrial marvel.** The Company has an unlimited field of operation **no competition** and among its customers nearly all **railroads, steel plants, power and electric lighting plants.** It earned and paid 15 per cent. last year. Only a limited amount of **preferred stock** is offered to careful, thrifty people wishing to invest their savings in a solid **permanent** business, which has a ready market for its entire output, and is not dependent upon the ordinary opportunities for speculative profit.

Prefered shares $1.00. With each preferred share goes a common share of $1.00, all full paid and non-assessable.

Send at once for prospectus, stock, and full information to

SANFORD MAKEEVER & CO.,

84 Adam St., Chicago 170 Broadway, New York

WOOD ... ZINC ETCHING HALF TONE ENGRAVING D. A. IRR 509 Washington St. BUFFALO, N.Y. WRITE FOR PRICES AND SAMPLES

MATCH Factory Machinery. W. E. WILLIAMS, Mfr., 217 South Clinton St., Chicago, U. S. A.

STEEL TYPEWRITER TYPE

TYPE WHEELS, MODELS & EXPERIMENTAL WORK, SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST N.Y.

Experimental & Model Work

Cir. & advice free. Wm. Gardam & Son, 45-51 Rose St., N.Y.

NOVELTIES & PATENTED ARTICLES

Manufactured by Contract. Punching Dies, Special Machinery. E. Konigslow & Bro., 181 Seneca St. Cleveland, O.

DRYING MACHINES. S. E. WORRELL, Hannibal, Mo.

ICE MACHINES, Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee Wis.

VOLNEY W. MASON & CO.,

Friction Pulleys, Clutches & Elevators

PROVIDENCE, R. I.

MODELS CHICAGO MODEL WORKS ESTABLISHED 1867 179 E. MADISON ST. CHICAGO, ILL. WRITE FOR CATALOGUE OF MODEL SUPPLIES.

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery. E. V. BAILLARD, Fox Bldg., Franklin Square, New York.

SIXTEENTH REVISED AND ENLARGED EDITION OF 1901.

The Scientific American Cyclopedia of Receipts, Notes and Queries.

15,000 RECEIPTS. 734 PAGES.

Price, $5.00 in Cloth. $6.00 in Sheep. $6.50 in Half Morocco. Post Free.

This work has been revised and enlarged.

900 NEW FORMULAS.

The work is so arranged as to be of use not only to the specialist, but to the general reader. It should have a place in every home and workshop. A circular containing full **TABLE OF CONTENTS** will be sent on application.

Those who already have the Cyclopedia may obtain the

1901 APPENDIX.

Price, bound in cloth, $1.00, postpaid.

MUNN & CO., Publishers, 361 BROADWAY, NEW YORK CITY.

© 1902 SCIENTIFIC AMERICAN, INC.

THOROUGH INSPECTIONS

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

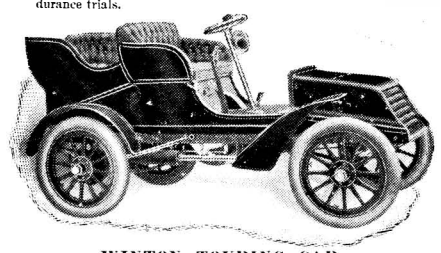
AND INSURANCE AGAINST LOSS OR DAMAGE TO PROPERTY AND LOSS OF LIFE AND INJURY TO PERSONS CAUSED BY

STEAM BOILER EXPLOSIONS

J. M. ALLEN, PRESIDENT — W. B. FRANKLIN, VICE PRESIDENT
J. B. PIERCE, SECRETARY — F. B. ALLEN, 2D VICE PRESIDENT
L. B. BRAINERD, TREAS. — L. F. MIDDLEBROOK, ASST SEC'Y

WINTON

GOLD MEDAL (first award) in the official speed trials.
SILVER CUP (first award) in the official hill climbing trials.
BLUE RIBBON (first award) in the official 100-mile non-stop endurance trials.



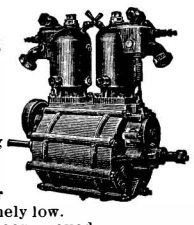
WINTON TOURING CAR.

It contains the simplest, most practical and best constructed motor manufactured or sold in America. Our new catalog sent upon request.

The Winton Motor Carriage Co., Cleveland, O., U.S.A.
NEW YORK. CHICAGO. BOSTON. PHILADELPHIA.

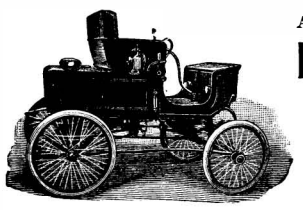
DO YOU WANT A MOTOR THAT GIVES NO TROUBLE?

TRY THE IMPORTED
KELECOM MOTORS
Single and Double Cylinder
Water Cooled



They have been thoroughly tried and found true.
Went through the 100-Mile Long Island test without a stop.
5, 7, 9, 11 H. P. { Single Cylinder / Double Cylinder
The price is extremely low.
The results have been proved.
Sole Agent
A. H. FUNKE, 101 Duane Street, New York.

The GROUT STEAM CARRIAGES ARE DESIRABLE



Because they are reliable and reasonable.

GROUT BROS. ORANGE, MASS.

CRUDE ASBESTOS
DIRECT FROM MINES

PREPARED ASBESTOS FIBRE for Manufacturers use

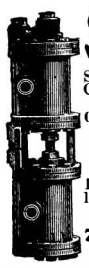
R. H. MARTIN, OFFICE, ST. PAUL BUILDING 220 B'way, New York.

THE MOST MODERN AUTO
ELMORE AUTOMOBILES.

Practical, Durable Efficient. Easy to control at any speed. Double cylinder motor, smooth gliding motion. 2 models, $800-$1500. Get further information free.

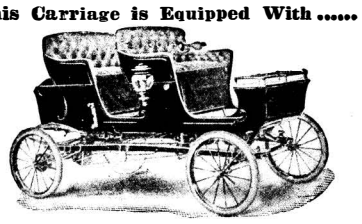
ELMORE MANUFACTURING CO., Clyde, O., U.S.A.

THE VICTOR Steam Pumps



Size, 9 inches by 3 inches, weight, 4½ pounds. Capacity of Air Pump, 80 pounds pressure on tanks or tires.
Capacity of Water Pump, 3 gallons per minute against 200 pounds boiler pressure.
PRICE, $30.00 EACH.
These pumps have been adopted by the Locomobile Co., the Mobile Co., and other leading manufacturers of steam carriages.
OVERMAN AUTOMOBILE CO., 7 East 42d Street, New York.
Send for Illustrated Circular.

This Carriage is Equipped With .....



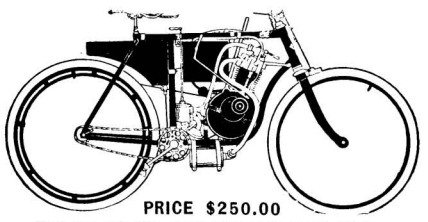
American Tubular Steel Wheels
AMERICAN TUBULAR WHEEL CO., Dept. C. Pittsburg, Pa.

SAVAGE

Only Hammerless Repeating Rifle in the World.
HIGHEST Development of SPORTING RIFLES

Constructed to shoot Six Different Cartridges. Adapted for GRIZZLY BEARS & RABBITS. .303 and 30-30 Caliber.
Every Rifle thoroughly guaranteed.
Write for new illustrated catalogue A.
SAVAGE ARMS CO., Utica, N.Y., U.S.A.
Manufacturers of SAVAGE Magazine and Magnetic Hammers. Send for Circular.

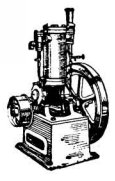
Orient Motor Cycle.



PRICE $250.00
Fitted with the New Orient 3 H. P. Motor.
Speed over 40 Miles per hour.
The Most Powerful Motor Bicycle in the World.
Write for Particulars. Agents Wanted.
WALTHAM MFG. CO., Waltham, Mass.

STEWARD'S WONDER
The Exponent of Highest Art in
ACETYLENE BURNERS Sample 25c. in stamps Ask for catalogue C.
STATE LINE MFG CO., Chattanooga, Tenn., U. S. A.
107 Chambers St., New York.

CHARTER ENGINE



USED ANY PLACE BY ANY ONE FOR ANY PURPOSE
Stationaries, Portables, Sawing Outfits, Hoisters, Engines and Pumps.
FUEL—Gasoline, Gas, Distillate.
Send for Illustrated Catalogue and Testimonials, and State Your Power Needs.
CHARTER GAS ENGINE CO., Box 148. STERLING, ILL.

IROQUOIS MACHINE COMPANY
Manufacture under patents
Improved Universal, Plain, Disc, Face
GRINDING MACHINES
WIRE DRAWING MACHINERY
150 Nassau Street, NEW YORK, U. S. A.

$750
HYDRO-CARBON.
20-Mile Speed.
20 per cent. Grades.
100-Mile Gasoline Tank.
300-Mile Water Tank.
900 lbs. 6 H. P. Actual.
Write for Catalogue.

FRIEDMAN AUTOMOBILE CO., 8 E. Van Buren Street, Chicago, Ill.

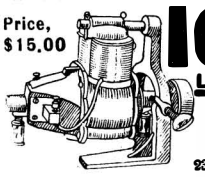
A GOOD INVESTMENT

For $1.75 we will send by express (not prepaid), complete N. D. Outfit with full instructions for learning TELEGRAPH OPERATING. A fascinating study that will enable you to earn good wages. Send 25 cents for universal dating stamp, by mail, postpaid. Send for our catalog. *Established* 1879.
J. H. BUNNELL & Co., Inc., 20 Park Place, New York.

CREST
3, 5, 7 H. P. MOTORS.
Sparking Plugs and Coils.

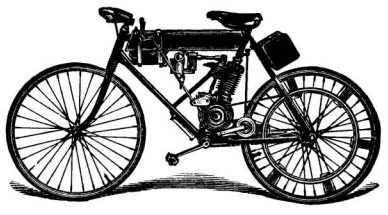
CREST MFG. CO., Cambridge, Mass.

GAS ENGINE IGNITERS
Price, $15.00



LATEST TYPE. BEST MADE.
For Marine, Automobile or Stationary Engines. Fully Guaranteed. Write for Circular.
The Carlisle & Finch Co., 233 E. Clifton Ave., Cincinnati, Ohio.

HELMET OIL LUBRICATES ANYTHING. IF YOU HAVE A HOT BOX TRY IT. C. H. BESLY & CO. CHICAGO, ILL. U.S.A.



THE NEW MARSH MOTOR CYCLE
Model 1902. Price $175.
A Gasoline Motor made with crank-disk, shaft in one piece, extra strong bearings, exhaust valve mechanism entirely within base, perfect lubrication, secured against dust, carburetter of the float-feed type which has reached the greatest perfection. This Motor Cycle is the latest acquisition in the art. Made of the best material, simple and perfect in every detail. Constructed by high skilled experts in every department and is without a peer. Full descriptive circular on application.
MOTOR CYCLE MANUFACTURING CO., Brockton, Mass., U.S.A.

Free Tuition *in the* Kodak Correspondence School of Photography

to every owner of a Kodak or Brownie Camera who purchases a one dollar copy of "Picture Taking and Picture Making."
EASTMAN KODAK CO.
Circular by mail upon request. Rochester, N. Y.

The FRANKLIN Model Shop

The Franklin Gas Engine
One-Half Horse Power
worth $100 complete. We sell all necessary castings, materials and detail drawings for $16.50. For real work—not a toy. 450 revolutions per minute. Upright or horizontal form. Finished parts sold separately. Runs by gas or gasolene. For boys and men with a mechanical turn. Write for circular 9.
PARSELL & WEED, 129-131 West 31st St., New York.

YACHTS AND LAUNCHES
(OPEN OR CABIN)
Marine Gasolene Engines

Row Boats and Dealer in Boat Fittings. I have on hand boats built and ready for delivery, guaranteed in every way to give perfect satisfaction. If you would have the best of boat construction at reasonable prices write or call on
AUG. J. FRITZ
180 Main St., West, Rochester, N. Y.

FOR LIGHT AND MEDIUM WORK
this new 14 inch
B. F. BARNES
Upright Drill is the best tool made. Substantial, well built, up to date. The driving power is strong and positive—the five-step cone gives wide range of speeds—will drill from 1/16-inch to ¾-inch. Reading matter on request.
B. F. BARNES COMPANY, Rockford, Ill.

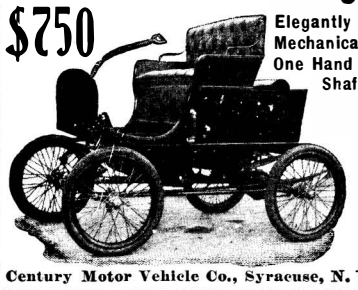
Also for Bromide Enlarging, Copying, Photo-Engraving. Intensely brilliant, very portable, burns kerosene, costs 1 cent per hour. Send for lists including Stereopticons, Moving Pictures, Slides and Microscopes.
WILLIAMS, BROWN & EARLE, Dept. 6, 918 Chestnut St., Philadelphia.

50 YEARS' EXPERIENCE
PATENTS
TRADE MARKS
DESIGNS
COPYRIGHTS &c.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. Handbook on Patents sent free. Oldest agency for securing patents.
Patents taken through Munn & Co. receive *special notice*, without charge, in the
Scientific American.
A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, $3 a year; four months, $1. Sold by all newsdealers.
MUNN & Co. 361 Broadway, New York
Branch Office, 625 F St., Washington, D. C.

Century STURDY STEAM CAR

$750



Elegantly Designed.
Mechanically Perfect.
One Hand Control.
Shaft Drive.
NO CHAIN.
CAN SHIP AT ONCE.
Century Motor Vehicle Co., Syracuse, N. Y., U. S. A.

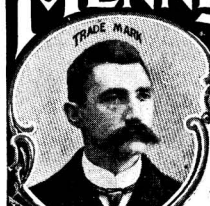
NEW ENGLAND WATCHES

have a world-wide reputation gained by results as accurate timekeepers. We make all sizes and styles. We sell only complete watches. Catalogs sent on request.

THE NEW ENGLAND WATCH CO.
37 & 39 Maiden Lane, New York — 131 Wabash Ave., Chicago.
Claus Spreckels Building, San Francisco.

Scales All varieties at lowest prices. Best Railroad Track and Wagon or Stock Scales made. Also 1000 useful articles, including Safes, Sewing Machines, Bicycles, Tools, etc. Save Money. Lists Free. CHICAGO SCALE CO., Chicago, Ill.

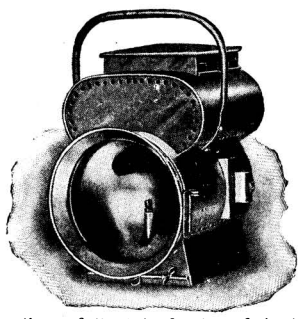
MENNEN'S BORATED TALCUM TOILET POWDER



A Positive Relief — For — PRICKLY HEAT, CHAFING, and SUNBURN, and all afflictions of the skin.
"A LITTLE HIGHER IN PRICE, PERHAPS, THAN WORTHLESS SUBSTITUTES, BUT A REASON FOR IT."
Removes all odor of perspiration. Delightful after Shaving. Sold everywhere, or mailed on receipt of 25c. Get Mennen's (the original). *Sample Free.*
GERHARD MENNEN COMPANY, Newark, N.J.

THE STANDARD ACETYLENE LAMPS FOR VEHICLES OF ALL SORTS FOR YEARS HAVE BEEN

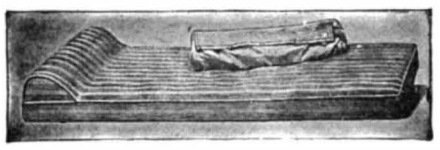
SOLAR LAMPS



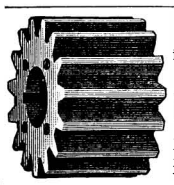
From the time of the introduction of Acetylene Gas there has been only one lamp that would stand every test—The Solar. The acme of Solar perfection is the new French Auto Headlight illustrated here. Our catalogue tells all about Solar Lamps of all kinds.
SEND FOR IT.
BADGER BRASS MFG. CO., - - Kenosha, Wis.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC.
WM JESSOP & SONS LTD 91 JOHN ST. NEW YORK

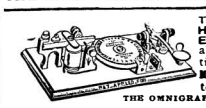
RESTFUL SLEEP
In Camp, on the Yacht and at Home.
"Perfection" Air Mattresses,
CUSHIONS and PILLOWS.



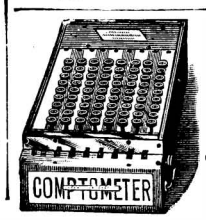
Style 61. Camp Mattress with Pillow attached. Also showing Mattress deflated.
Clean and Odorless, will not absorb moisture.
Can be packed in small space when not in use.
Send for Illustrated Catalogue.
MECHANICAL FABRIC CO., PROVIDENCE, R. I.



QUIET RUNNING
is only ONE of the advantages to be gained by using
New Process Pinions
instead of metal pinions. Our catalogue will tell you others. Write for it. We also make Metal Gears.
THE NEW PROCESS RAWHIDE CO., - Syracuse, N. Y.



THE OMNIGRAPH Will Teach Telegraphy absolutely correct in the shortest possible time at a total cost of four dollars. TRANSMITTER, Key and Sounder. Expert operator with you all the time. Circular free.
THE OMNIGRAPH MFG. CO. 39 Cortlandt St., New York



ALL ARITHMETICAL PROBLEMS solved rapidly and accurately by the Comptometer. Saves 60 per cent of time and entirely relieves mental and nervous strain. Adapted to all commercial and scientific computation. Why don't you get one? *Write for pamphlet.*
FELT & TARRANT MFG. CO. 52-56 ILLINOIS ST. CHICAGO.

© 1902 SCIENTIFIC AMERICAN, INC.